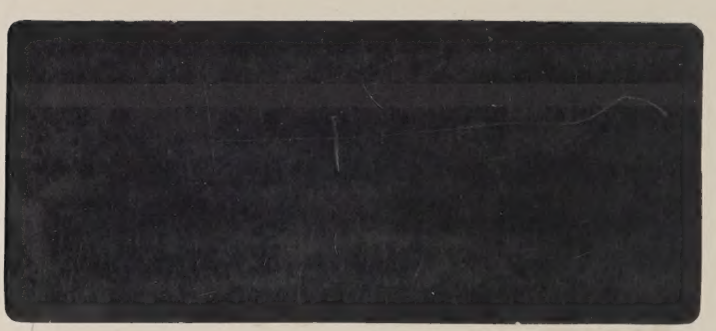
Brüel & Kjær

7005/6
Tape Recorder

Valid from serial no. 903 768

037–0393

Service



7005/6
Tape Recorder

Valid from serial no. 903 768

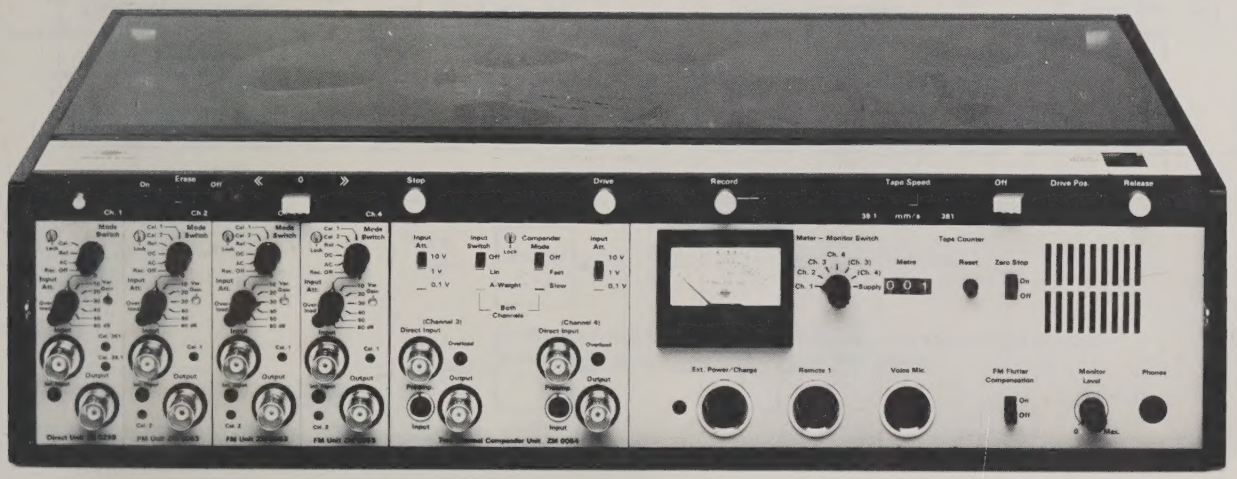
037–0393

Consisting of:	page	date
Service Instruction	0–1	9.81
- -	0–3	9.81
- -	0–4	9.81
Checking Procedure:		
Tape Transport	1–1	9.81
Direct Unit ZE 0299	1–3	9.81
FM Unit ZM 0053	1–5	9.81
Two Channel Compander Unit ZM 0054	1–7	9.81
Adjustment Procedure:		
Tape Transport Electrically	2–1	9.81
- - -	2–2	9.81
- - -	2–3	9.81
- - -	2–5	9.81
- - -	2–7	9.81
Direct Unit ZE 0299	2–9	9.81
- - -	2–11	9.81
- - -	2–13	9.81
FM Unit ZM 0053	2–15	9.81
- - -	2–16	9.81
- - -	2–17	9.81
- - -	2–19	9.81
Two Channel Compander Unit ZM 0054	2–21	9.81
- - - - -	2–23	9.81
Tape Transport Mechanical	3–1	9.81
- - -	3–2	4.81
- - -	3–3	4.81
- - -	3–4	4.81
- - -	3–5	4.81
- - -	3–6	4.81
- - -	3–7	4.81
- - -	3–8	9.81
- - -	3–9	4.81
- - -	3–10	4.81
- - -	3–11	4.81
- - -	3–12	9.81

Printed Circuit Boards:	page	date
ZE 0299 Direct Unit:		
ZE 0284 Record	1	9.81
ZE 0285 Reproduce	3	9.81
Circuit Diagram	5	9.81
ZH 0194 Servo Board	1	9.81
ZI 0046 Reference Oscillator Board	1	9.81
ZM 0053 FM Unit:		
ZM 0051 Demodulator	1	9.81
ZM 0052 Modulator	3	9.81
Circuit Diagram	5	9.81
ZM 0054 Two Channel Compander Unit:		
ZE 0310	1	9.81
-	2	9.81
ZE 0311	3	9.81
Circuit Diagram	5	9.81
ZZ 0158 Main Board	1	9.81
- -	3	9.81
- -	4	9.81
Circuit Diagram	5	9.81
ZZ 0159 Interface Board	1	9.81
- -	2	9.81
Circuit Diagram	3	9.81
Interconnection Diagram/Parts List	4–1	9.81

Digitized by the Internet Archive
in 2025

https://archive.org/details/manualsplus_09429



Spare Parts

Please state type and serial number of the instrument when ordering spare parts.

Attention

The opening of the apparatus is likely to expose live parts. Any adjustment, maintenance or repair of the opened apparatus under voltage shall be carried out only by a skilled person who is aware of the hazards involved.

Updating

Due to the constant progress in technology the instrument will from time to time be brought up to date in order to provide continuously improved performance.

For this reason there may be small variations between the instrument and the Service Instruction.

However, the local Service Representative is in possession of all informations regarding any change that has been made.

Trouble Shooting

If any fault should occur, check the instrument according to the Checking Procedure.

The Checking Procedure is divided up into sections, where each section will refer to a subsection in the Service Instruction corresponding to a specific part of the instrument.

Before correcting any apparent deviation make sure that the measuring instrument has tolerances small enough not to affect the measurement.

When a fault has been traced and corrected, the voltages and adjustments influenced by the correction must be rechecked. The complete instrument should then be tested to make sure that all basic functions are operative.

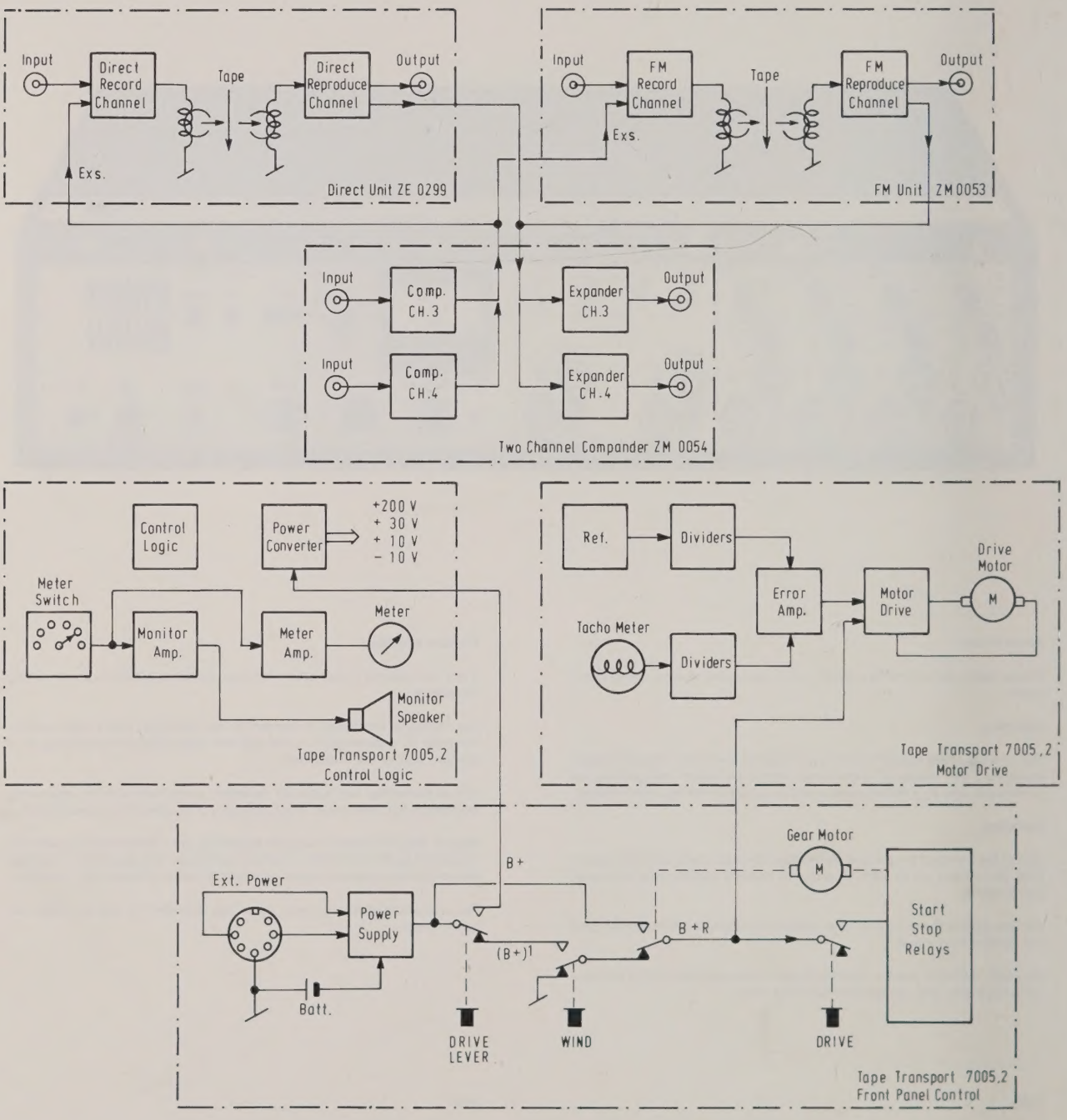
The tolerances given in these notes are intended for use as guide for adjustments.

7005:

Consists of a tape transport and monitor mainframe with 1 Direct and 3 FM Record/Reproduce Units plus a Two Channel Compander Unit.

7006:

Consists of a tape transport and monitor mainframe with the option of ordering any combination of FM and Direct Units with or without the Two Channel Compander Unit.


Input
Direct Record Channel
Tape
Direct Reproduce Channel
Output
Exs.
Direct Unit ZE 0299
Input
FM Record Channel
Tape
FM Reproduce Channel
Output
Exs.
FM Unit ZM 0053
Input
Comp. CH.3
Expander CH.3
Output
Input
Comp. CH.4
Expander CH.4
Output
Two Channel Compander ZM 0054
Control Logic
Power Converter
+200 V
+ 30 V
+ 10 V
- 10 V
Meter Switch
Monitor Amp.
Meter Amp.
Meter
Monitor Speaker
Tape Transport 7005,2 Control Logic
Ref.
Dividers
Drive Motor
Error Amp.
Motor Drive
M
Tacho Meter
Dividers
Tape Transport 7005,2 Motor Drive
Gear Motor
M
B+
Ext. Power
Power Supply
Batt.
(B+)1
B+R
Start Stop Relays
DRIVE LEVER
WIND
DRIVE
Tape Transport 7005,2 Front Panel Control

Tape Winding

ZERO STOP: "On"

Load the Recorder with tape.
Reset the Metre Counter.
Wind 50 m tape and measure the time: 42 ± 5 s.

Rewind the 50 m.
Check that the tape stops at "000".
If necessary consult Tape Transport Electrical 7005.2.

Tape Drive

Activate "Drive".

Drive Lever to "Drive Pos."
TAPE SPEED to "38.1 mm/s"

Check that the tape runs and that the "38.1" LED lights.

TAPE SPEED to "381 mm/s"

Check that the tape runs and that the "381" LED lights.
If necessary consult Tape Transport Electrical 7005.2.

Record

Activate "Record" and "Drive".

Drive Lever to "Drive Pos."
ERASE to "On"

Check that the "Record" LED and the "Erase" LED light.

Auto Stop

ZERO STOP to "Off"

Rewind the tape and check that the Recorder stops when the reel is empty.
If necessary consult Tape Transport Electrical 7005.2.

Calibration

Activate "Record" and "Drive".

MODE SWITCH: "Ref."
INPUT ATT.: "0 dB"
"Var. Gain" Fully Clockwise
TAPE SPEED: "381 mm/s"
ERASE: "On"
ZERO STOP: "On"
FM FLUTTER COMP.: "Off"
METER-MONITOR SWITCH to Ch. in question
Drive Lever to "Drive Pos."
(Compander INPUT SWITCH: "Off")

Turn "Monitor Level" clockwise and check that the 1 kHz tone can be heard from the Monitor Speaker.

Check the Meter deflection: 0 ± 1 dB.

MODE SWITCH to "Cal."

Check the Meter deflection: 0 dB.
If necessary adjust "Cal. 381".

TAPE SPEED to "38.1 mm/s"

Check the Meter deflection: 0 dB.
If necessary adjust "Cal. 38.1".

Sensitivity

Input signal to "Input": 1000 mV, 1 kHz.

MODE SWITCH to "AC"
INPUT ATT. to "30 dB"
TAPE SPEED to "381 mm/s"

Check the voltage on "Output": 1000 ± 100 mV (QR 1003).

Record 10 m tape.

Playback the recorded tape and check the voltage on "Output": 1000 ± 100 mV.

Frequency Response

Record 10 m with the 1 V signal where the frequency is varied between 40 Hz and 60 kHz.

Playback the recorded tape and check the voltage on "Output": 1000 ± 230 mV.

Signal to Noise Ratio

Record 10 m with the "Input" shorted to ground.

Playback the recorded tape and check the voltage on "Output": Max. 8 mV ~ –42 dB re 1 V. (Lin).

TAPE SPEED to "38.1 mm/s"

Check again:

Sensitivity.
Frequency Response (20 Hz to 6 kHz)
Signal to Noise Ratio.
Record length approx. 1 m. Tolerances as before.

Distortion

Input signal to "Input": 1 V, 6 kHz.

TAPE SPEED to "381 mm/s"

Record 10 m.

Playback the recorded tape and check the 3rd harmonic on "Output": 1.0, + 0.0, –0.1%. (Bandwidth: 316 Hz).

TAPE SPEED to "38.1 mm/s"

Input signal to "Input": 1 V, 600 Hz.
Check as above.

3rd harmonic: 1.0, + 0.3, –0.1%.
(Bandwidth: 31.6 Hz)

Calibration

Adjust "Cal. 1" to minimum deflection on the built in Meter.

MODE SWITCH: "Cal. 1"
INPUT ATT.: "30 dB"
"Var. Gain": Fully Clockwise
TAPE SPEED: "381 mm/s"
ERASE: "On"
ZERO STOP: "On"
FM FLUTTER COMP.: "Off"
METER MONITOR SWITCH to Ch. in question
(Compander INPUT SWITCH: "Off")
Drive Lever to "Drive Pos."

MODE SWITCH to "Cal. 2"

Adjust "Cal. 2" to minimum deflection on the Meter.

MODE SWITCH to "Ref."
INPUT ATT. to "0 dB"

Turn the "Monitor Level" clockwise and check that the 1 kHz tone can be heard from the Monitor Speaker.

Check the Meter deflection: 0.0 ± 0.2 dB.

Sensitivity

Input signal to "Input": 1000 mV, 1 kHz.

MODE SWITCH to "DC"
INPUT ATT. to "30 dB"

Check the voltage on "Output": 1000 ± 10 mV.

Record 10 m tape.

Playback the recorded tape and check the voltage on "Output": 1000 ± 10 mV.

Frequency Response

Record 10 m with the 1 V signal where the frequency is varied between 10 Hz and 12.5 kHz.

Playback the recorded tape and check the voltage on "Output": 1000 + 10, – 90mV.

Signal to Noise Ratio

Record 10 m with the "Input" shorted to ground.

Playback the recorded tape and check the voltage on "Output": Max. 6.3 mV ~ 44 dB re 1 V. (lin).

TAPE SPEED to "38.1 mm/s

Check again:

Sensitivity.
Frequency Response (0 Hz to 1 kHz).
Signal to Noise Ratio: Max. 10 mV ~ –40 dB re 1 V.
Record length approx. 1 m. Tolerances as before.

Distortion

Input signal to "Input": 1 V, 5 kHz.

TAPE SPEED to "381 mm/s"

Record 10 m tape.

Playback the recorded tape and check the 2nd harmonic on "Output": Max. 1.5% (Bandwidth: 316 Hz).

TAPE SPEED to "38.1 mm/s"

Input signal to "Input" 1 V, 500 Hz.

Check as above (Bandwidth: 31.6 Hz).

Phase Control

Input signal to Ch. 2 and 4 "Input": 1 V, 10 kHz. (Both FM Units).

TAPE SPEED to "381 mm/s"

Check by means of an oscilloscope the phase difference between the signal on the two "Output".

Max. difference: ± 10 μs.

If necessary consult Tape Transport, Mechanical 7005.3 item 3.10.

Sensitivity

INPUT ATT.: "1 V"
INPUT SWITCH: "Lin"
COMPANDER MODE: "Normal"
MODE SWITCH Ch. 3, 4: "AC"
TAPE SPEED: "381 mm/s"
ERASE: "On"
ZERO STOP: "On"
METER-MONITOR SWITCH to Ch. in question
Drive Lever to "Drive Pos."

Mount two FM Units or two Direct Units into Ch. 3 and Ch. 4.

Input signal to (Compander Channel 3) "Direct Input": 1000 mV, 1 kHz.

Check the Meter deflection: 0.0 ± 0.5 dB.

Check that the "Int. Input" LEDs on the FM or Direct Units Ch. 3 and 4 light.

Record 10 m tape.

Playback the recorded tape and check the voltage on "Output" (Channel 3): 1000 ± 100 mV.

Frequency Response

Record 10 m tape with the 1 V signal where the frequency is varied between 10 Hz and 10 kHz for the FM Units and 40 Hz to 60 kHz for the Direct Units.

Playback the recorded tape and check the voltage on "Output" (Channel 3):
1000 ± 150 mV for FM Units
1000 ± 400 V for Direct Units

Signal to Noise Ratio

Record 10 m with "Direct Input" (Compander Channel 3) shorted to ground.

Playback the recorded tape and check the voltage on "Output" (Channel 3): Max. 316 μV ~ –70 dB re. 1 V.

A-Weighting

INPUT SWITCH to "A-Weight"
METER-MONITOR SWITCH to Ch. in question

Input signal to (Compander Channel 3) "Direct Input" : 1 kHz and the voltage adjusted for a Meter deflection: 0.0 dB.

Check the Meter deflection at 20 kHz: –10.0 ± 0.2 dB
at 100 Hz: –20.0 ± 0.2 dB

Repeat all checks as above for (Compander Channel 4).

Compander-Expander check

INPUT SWITCH to "Lin"
Ch. 1.
MODE SWITCH: "AC"
INPUT ATT.: "30 dB"
Ch. 2.
MODE SWITCH: "Ref"
INPUT ATT.: "0 dB"
Ch. 3 and 4.
MODE SWITCH: "AC"
INPUT ATT.: "0 dB"

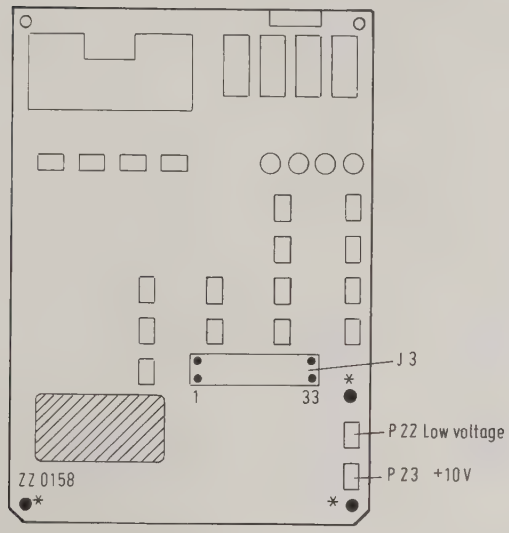
Connect as follows:
"Output" (Compander Channel 4) to "Input" (Ch. 1).
"Output" (Ch. 2) to "Direct Input" (Compander Channel 3).
"Output" (Compander Channel 3) to "Direct Input" (Compander Channel 4).

Now 1 V, 1 kHz Ref signal from Ch. 2 goes via (Channel 3), (Channel 4) to "Input" Ch. 1

Check the Meter deflection for all pos. of METER-MONITOR SWITCH (except "Supply"): 0 ± 1 dB.

Ch. 2.
INPUT ATT to "–10 dB"

Check the Meter deflection: Ch. 1 and Ch. 2: –10.0 ± 0.5 dB
Ch. 3 and Ch. 4: –5.0 ± 0.5 dB
(Ch. 3) and (Ch. 4): –10.0 ± 0.5 dB



Viewed from the component side.

Unscrew the three screws marked * and swing out the board.

Use Extension Cable (AR 0913) between P.C. Board and main chassis.

2.1 DC Voltages

Drive Lever to "Drive Pos."

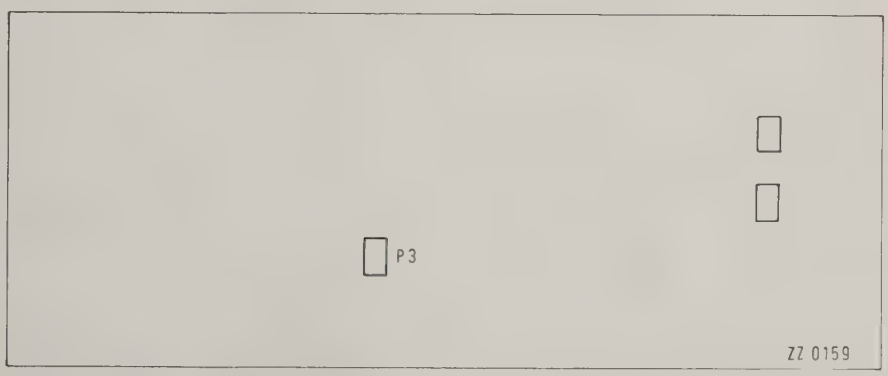
Check the following voltages:

ZZ 0158, J3 pin 11: + 10.01 ± 0.01 V.
If necessary adjust P23

J3 pin 15: –10.4 ± 0.1 V
J3 pin 2: approx + 30 V (loaded with a Preamp. on Comp. Preamp. "Input").

Check that the + 10 V at J3 pin 11 disappears when the battery voltage goes below 5.5 V.

Check that the + 10 V comes back when the battery voltage increases above 7.2 V.
If necessary adjust P22.
(Simplified Diagram 2–5).



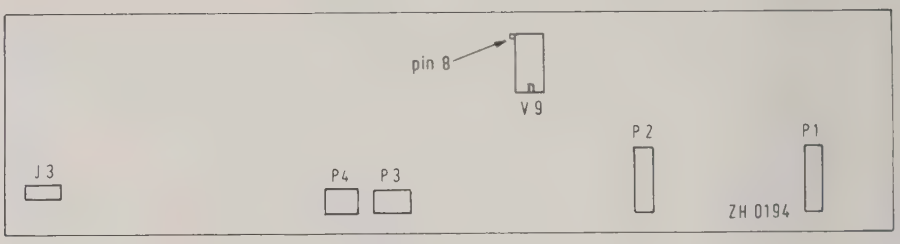
2.2 Auto Stop Adjustment

TAPE SPEED: "38.1 mm/s"
Drive Lever to "Drive Pos."

Remove the tape from Recorder
Remove the top cover.

Turn P3 on ZZ 0159 fully Clockwise.
Activate "Drive".

Slowly turn P3 counter clockwise until the Recorder stops and then approx. 45 degrees more.
(Avoid strong light on the photo cell, it can influence the adjustment.)
(Simplified Diagram 2–3)



2.3 Tacho Offset Adjustment

TAPE SPEED: "38.1 mm/s"
Drive Lever to "Drive Pos."

Load the Recorder with tape.

Activate "Drive".

Check at V9 pin 8 that the level of the tops is equal.
If necessary adjust P3 (ZH 0194).
(Simplified Diagram 2–7).

2.4 Synchron Adjustment

TAPE SPEED: "381 mm/s"
Drive Lever to "Drive Pos."

Decrease the battery voltage (Ext. Power Supply) to 6.5 V.

Adjust P1 (ZH 0194) to the point where the "381" LED just lights and then 2 turns more.

TAPE SPEED to "38.1 mm/s"

Increase the battery voltage to 10 V.
Adjust P2 to the point where the "38.1" LED just lights and then 2 turns more.
(Simplified Diagram 2–7).

2.5 Wind Speed Adjustment

Check 7 V at J3 pin 2 (Motor +) while winding.
If necessary adjust P4 (ZH 0194).
(Simplified Diagram 2–7).

2.6 Meter and Ref. Circuit

Mount a Direct Unit or a FM Unit into Ch. 1.

INPUT ATT: "0 dB"
"Var. Gain": Fully clockwise
MODE SWITCH: "Off"
METER-MONITOR SWITCH: "Ch. 1"
Drive Lever to "Drive Pos."

Check the Meter deflection: "– ∞"
If necessary adjust the Mechanical Zero Adjustment on the built In Meter.

Check the Meter deflection: "– ∞"
If necessary adjust P1 on ZZ 0159.

MODE SWITCH to "AC"

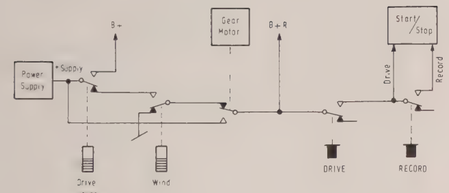
Input signal to "Input": 31.6 mV, 1 kHz.
Check the Meter deflection: 0.0, + 0.0, –0.5 dB.
If necessary adjust P2 on ZZ 0159.
(Simplified Diagram 2-5).

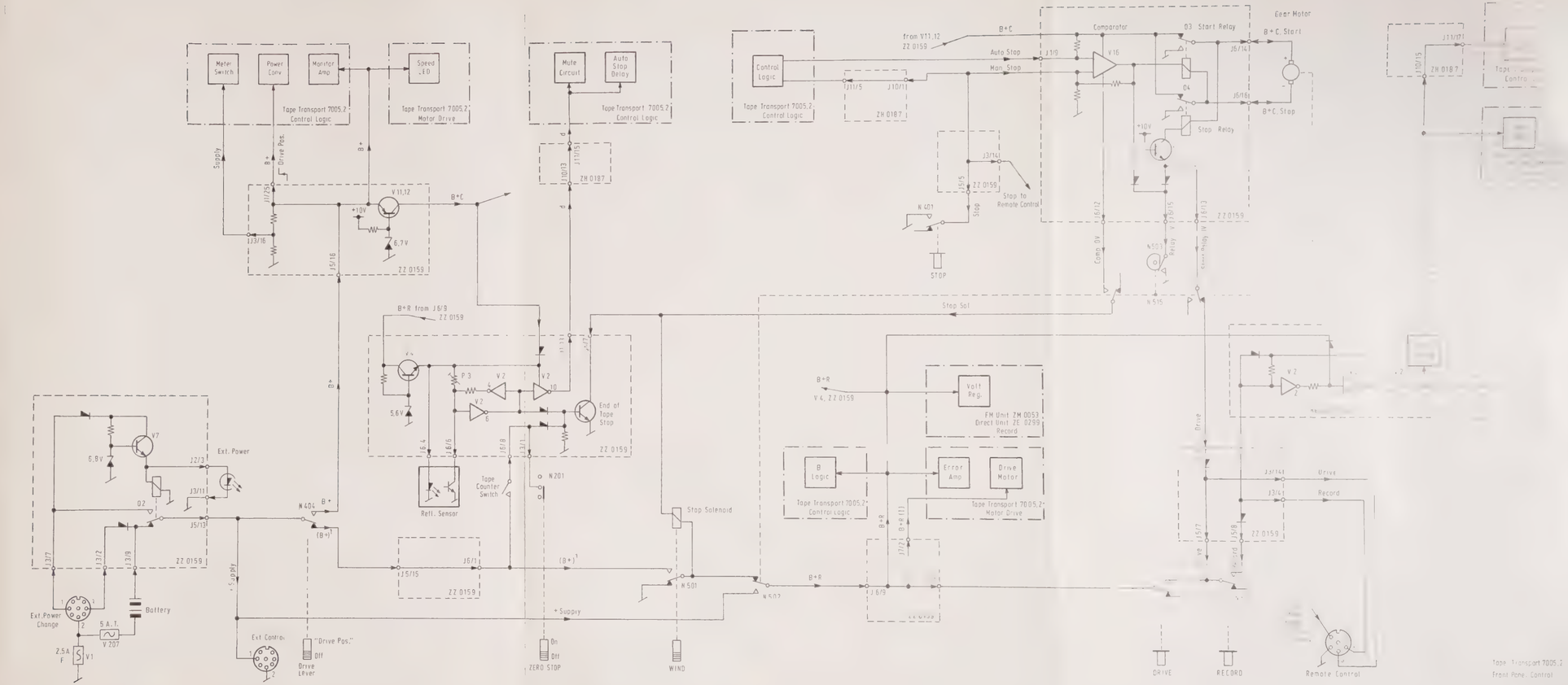
MODE SWITCH to "Ref."

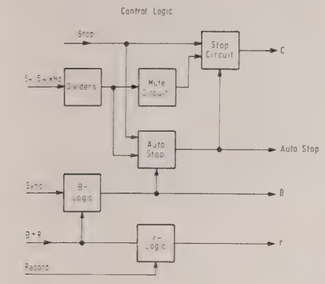
Check the Meter deflection: 0.0 ± 0.1 dB.
If necessary adjust P2 on ZI 0046.
(Simplified Diagram 2-7).

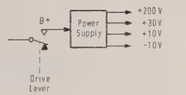
Tape Transport Electrical 7005.2
SIMPLIFIED DIAGRAM

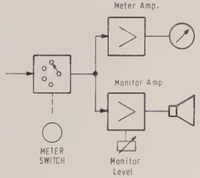
Front Panel Control

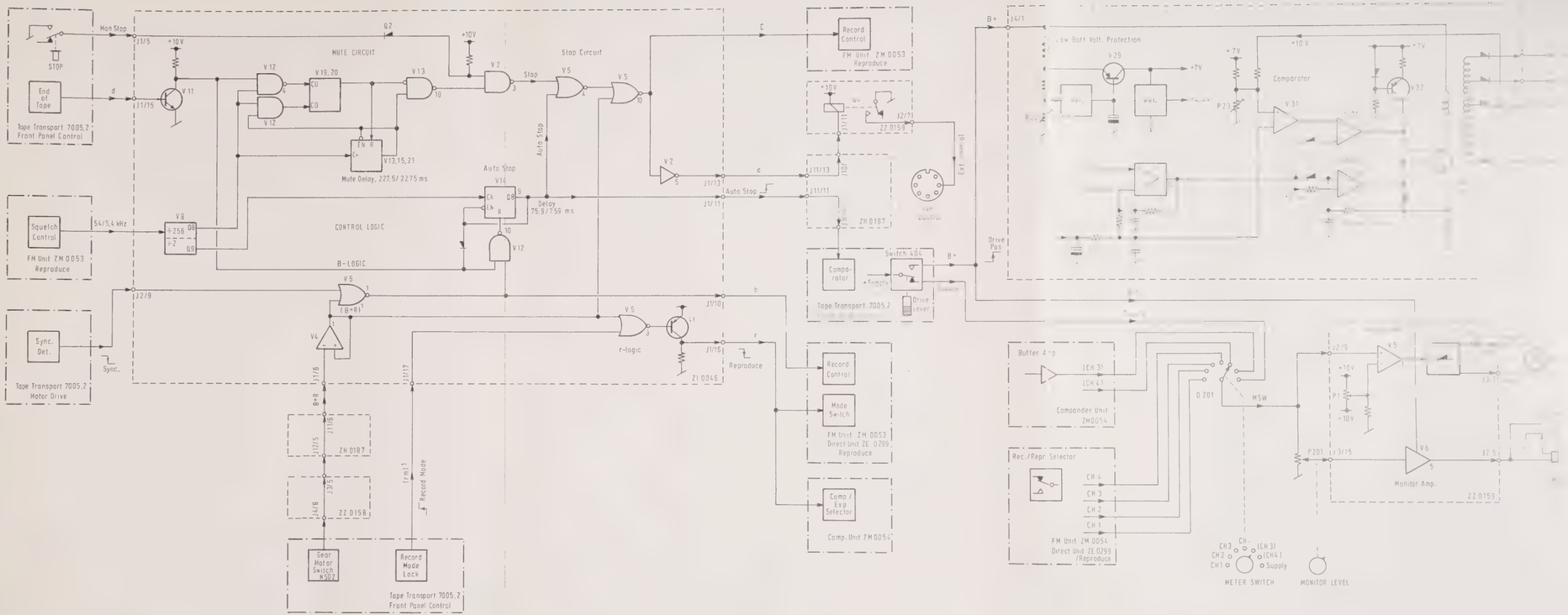


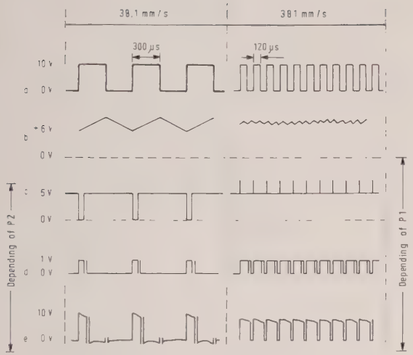



Control Logic
Stop
Sync
B+2
Remote
Dividers
Mute Circuit
Auto Stop
B-Logic
r-Logic
Stop Circuit
C
Auto Stop
B
r

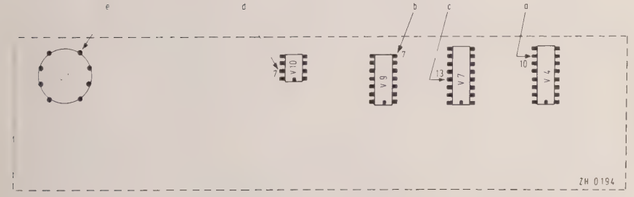

B+
Drive Lever
Power Supply
+200 V
+30 V
+10 V
-10 V

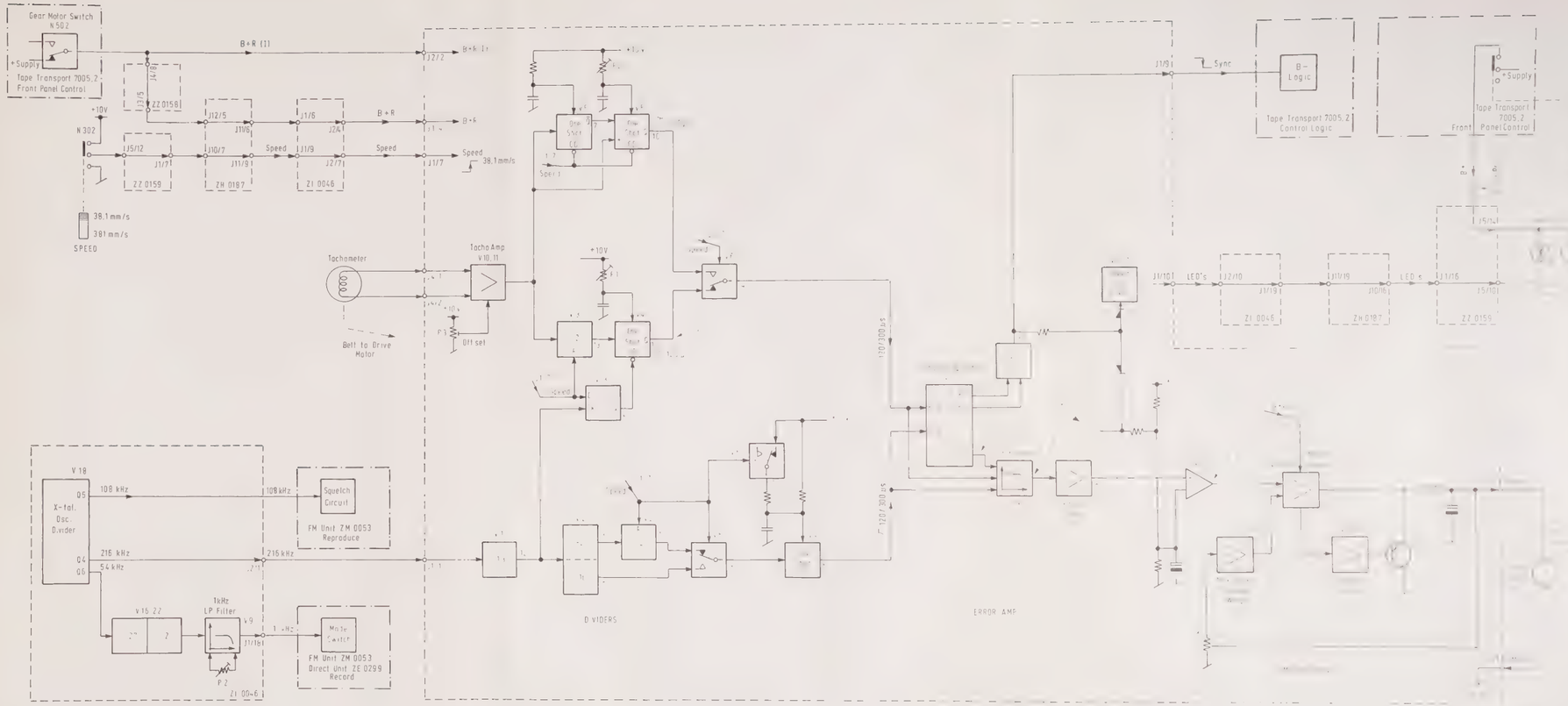

Meter Amp.
Monitor Amp.
METER SWITCH
Monitor Level

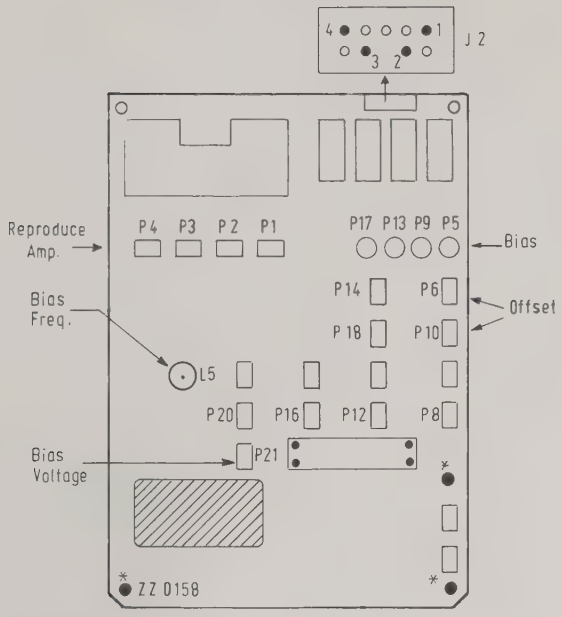

Man Stop
STOP
End of Tape
Tape Transport 7005.2 Front Panel Control
MUTE CIRCUIT
Mute Delay, 227,5/2275 ms
Stop Circuit
Auto Stop
Delay 75,9/759 ms
CONTROL LOGIC
B-LOGIC
Squelch Control
FM Unit ZM 0053 Reproduce
54/5,4 kHz
Sync.
Sync. Det.
Tape Transport 7005.2 Motor Drive
r-logic
Reproduce
Record Control
FM Unit ZM 0053
Mode Switch
FM Unit ZM 0053 Direct Unit ZE 0289 Reproduce
Comp / Exp Selector
Comp. Unit ZM 0054
ZZ 0158
Gear Motor Switch M502
Record Mode Lock
Tape Transport 7005.2 Front Panel Control
Record Mode
Comparator
Switch 4,84
Drive Lever
Tape Transport 7005.2
Low Batt Volt. Protection
Comparator
Buffer Amp
Compander Unit ZM0054
Rec./Repr. Selector
FM Unit ZM 0054 Direct Unit ZE 0289 /Reproduce
MSW
METER SWITCH
MONITOR LEVEL
Monitor Amp.
ZZ 0159



Pulse diagram of pulses on the Simplified Diagram.







Viewed from the component side.

Unscrew the three screws marked * and swing out the board.

Use Extention Cable (AR 0913) between P.C. Board and main chassis.

Record Amplifier Offset

TAPE SPEED: "381 mm/s"
ERASE: "On"
Drive Lever to "Drive Pos."

Measure the voltage at J2 pin 1 (ZZ 0158): 0 ± 10 mV.
If necessary adjust P6 (Ch. 1).

Repeat as above for the Ch. 2 to 4 using the J2 socket pin 2 to 4.
If necessary adjust the potentiometers P10, P14 and P18 respectively.

Bias Adjustment

MODE SWITCH to "AC"
INPUT ATT to "0 dB"
"Var. Gain" to Fully clockwise

Insert a Direct Unit into Ch. 1.

Input signal to "Input": 10 mV, 60 kHz.

Activate "Record"and "Drive".

Turn P5 on ZZ 0158 fully counterclockwise.
Turn P5 clockwise to max. "Output" voltage and further on to –3 dB below max.

If a max. peak cannot be found check the bias signal on L5 pin 2. (Max. capacitive load: 25 pF).
Frequency: 246 ± 1 kHz.
If necessary adjust L5.

Voltage: 3.6 V_{RMS}
If necessary adjust P21.

Repeat as above for the Ch. 2 to 4 using the potentiometers P9, P13, and P17 respectively.

Record Current Adjustment

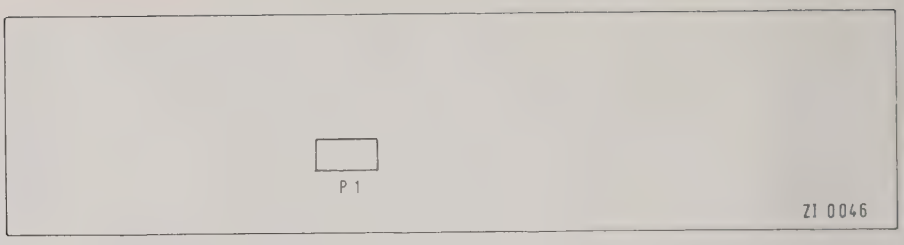
Input signal to "Input", 31.6 mV, 6 kHz.

Activate "Record" and "Drive".

Check the 3rd harmonic at the "Output": 1.0, + 0.0, –0.1%.
(Bandwidth: 316 Hz.)

If necessary adjust P8 (ZZ 0158).

Repeat as above for the Ch. 2 to 4 using the potentiometers P12, P16, and P20 respectively.



54-5.4 kHz Cal. Adjustment

Activate "Stop".

MODE SWITCH to "Cal"
"Var. Gain": Fully Clockwise

Check on the built in Meter: 0.0 ± 0.2 dB.
If necessary adjust P1 on ZI 0046.

Reproduce Amplifier Adjustment

Input signal to "Input": 31.6 mV, 1 kHz.

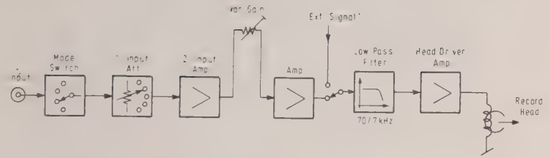
Activate "Record" and "Drive".

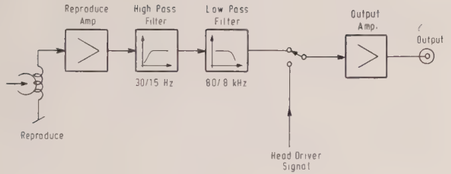
Check the "Output" voltage: 1000 ± 5 mV.
If necessary adjust P1 (ZZ 0158).

TAPE SPEED to "38.1 mm/s"

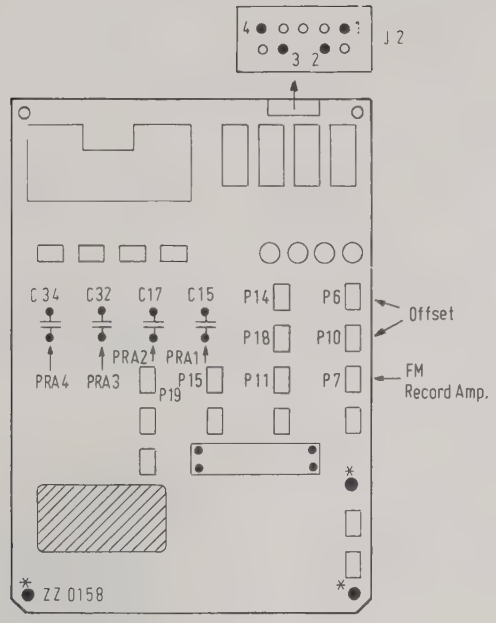
Check the "Output" voltage: 1000 ± 5 mV.
If necessary adjust P1 until both speeds are within the tolerances.

Repeat the above adjustment for the CH. 2 to 4 using the potentiometers 2 to 4.


Var. Gain
Ext. Signal
Mode Switch
Input
Input Att
2. Input Amp
Amp
Low Pass Filter
Head Driver Amp
Record Head
70/7 kHz



Direct Unit ZE 0299 Reproduce



Viewed from the component side.

Unscrew the three screws marked * and swing out the board.

Use Extention Cable (AR 0913) between the P.C. Board and the main chassis.

2.1 Record Amplifier Offset

Measure the voltage at J2 pin 1 (ZZ0158): 0 ± 10 mV.
If necessary adjust P6 (Ch. 1).

TAPE SPEED: "381 mm/s"
ERASE: "On"
METER-MONITOR SWITCH: "Ch. 1"
Drive Lever to "Drive Pos."

Repeat as above for the Ch. 2 to 4 using the J2 socket pin 2 to 4.
If necessary adjust the potentiometers P10, P14, and P18 respectively.

Record Current Adjustment

Insert a FM Unit into Ch. 1.

Set MODE SWITCH to "Cal. 1" and "Cal. 2" respectively.
Check the built in Meter reading: approx. -∞.

MODE SWITCH to "AC"

Activate "Record" and "Drive".

Adjust P7 on ZZ 0158 for max. output at "PRA 1" (C15 on ZZ 0158).

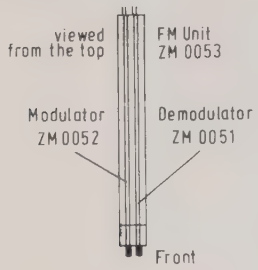
Input signal to "Input" 5 kHz adjusted to 0 dB at the built in meter.

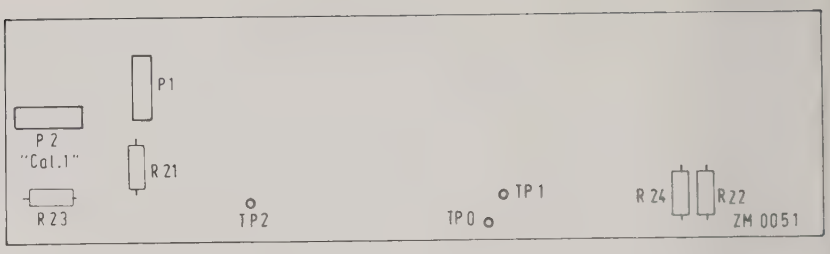
Check the 2nd harmonic on "Output": max. 1.5%.
If necessary readjust P7.

METER-MONITOR SWITCH to Ch. in question

Repeat as above for the Ch. 2 to 4 using the potentiometers P11, P15, P19 respectively (C17, C32, C34 ~ PRA 2, 3, 4).

continued





2.2 Demodulator ZM 0051 Adjustment

MODE SWITCH: "Cal. 1"
INPUT ATT.: "0 dB"
"Var. Gain": Fully clockwise
METER-MONITOR SWITCH: "Ch. 2"
TAPE SPEED: "38.1 mm/s"
FM FLUTTER COMP.: "Off"
Drive Lever to "Drive Pos."

Insert the FM Unit in Ch. 2.
Use the Extention Board AR 0177.

Check the voltage at TP1: 3570 V ± 60 mV.
If necessary change the value of resistor R24 in proportion to the voltage.

TAPE SPEED to "381 mm/s

Check as above.
If necessary change value of the resistor R22.

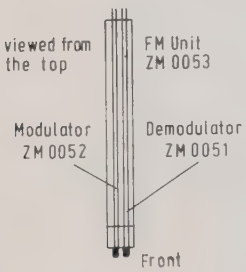
TAPE SPEED to "38.1 mm/s"

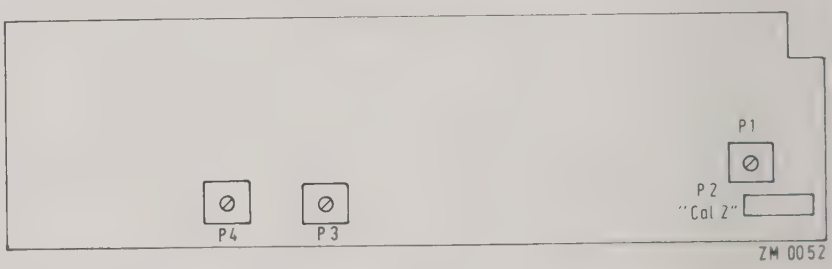
Check the built in Meter reading: –∞.
If necessary adjust P2 "Cal. 1".

TAPE SPEED to "381 mm/s"

Check the built in Meter reading: –∞.
If necessary adjust P1.

Repeat the adjustment of P1 and P2 as they influence each other.





Modulator ZM 0052 Adjustment

FM FLUTTER COMP. to "On"
MODE SWITCH to "DC"

Check the built in Meter reading: –∞.
If necessary adjust P2 "Cal. 2".

FM FLUTTER COMP. to "Off"
INPUT ATT. to "–60 dB"

Check the built in Meter reading: –∞.
If necessary adjust P1.

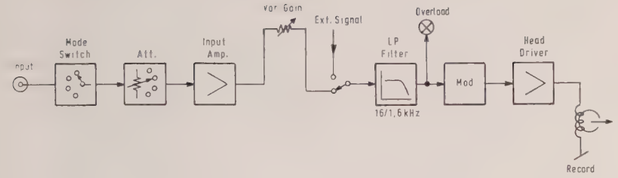
MODE SWITCH to "Cal. 2"

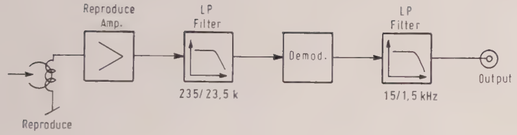
Check the built in Meter reading: –∞.
If necessary adjust P4.

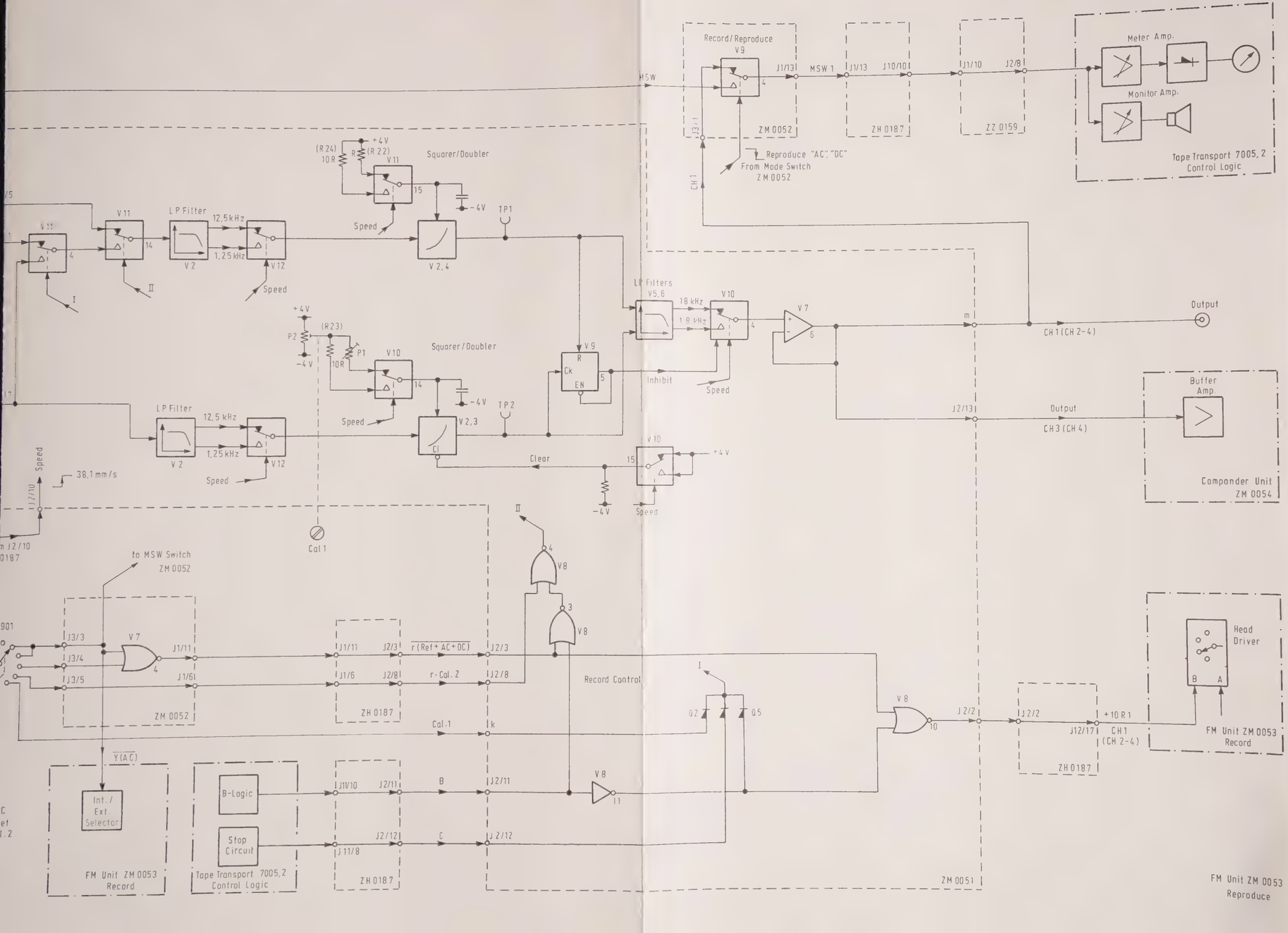
MODE SWITCH to "Ref."
INPUT ATT. to "0 dB"

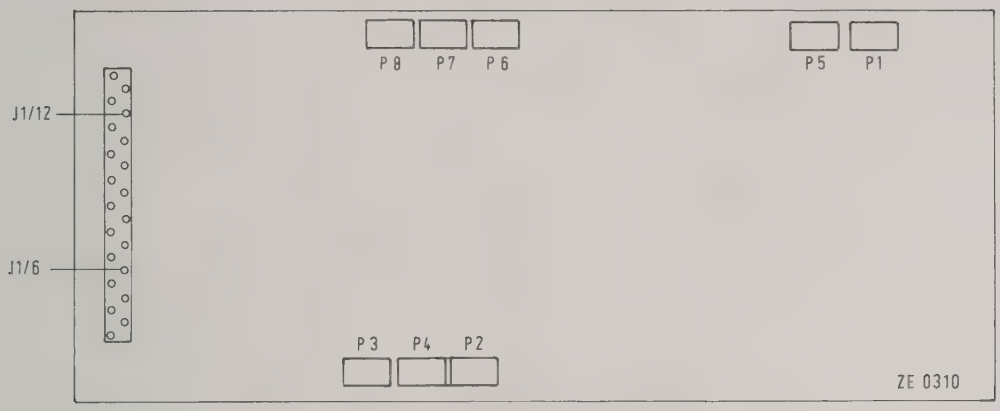
Check the voltage on "Output": 1000 ± 10 mV.
If necessary adjust P3.

Check the built in Meter reading: 0.0 ± 0.1 dB
If necessary consult item 2.6 Tape Transport Electrical.


Input
Mode Switch
Att.
Input Amp.
Var Gain
Ext. Signal
LP Filter
16/1.6 kHz
Overload
Mod
Head Driver
Record


Reproduce Amp.
LP Filter
Demod.
LP Filter
Output
235/23,5 k
15/1,5 kHz
Reproduce


Record/Reproduce
V 9
MSW
J1/13
MSW 1
J1/13
J10/10
J1/10
J2/8
ZM 0052
ZH 0187
ZZ 0159
Meter Amp.
Monitor Amp.
Tape Transport 7005, 2
Control Logic
Reproduce "AC" "DC"
From Mode Switch
ZM 0052
CH 1
Squarer/Doubler
V 11
(R 24)
10R
(R 22)
+4V
-4V
TP1
Speed
LP Filter
12,5kHz
1,25kHz
V 2
V 12
V 2,4
I
II
LP Filters
V5,6
18 kHz
1,8 kHz
V 10
V 7
Output
CH 1 (CH 2-4)
(R 23)
P2
P1
10R
Squarer/Doubler
V 9
R
Ck
EN
Inhibit
Speed
TP2
V 2,3
Cl
Clear
Buffer
Amp.
J2/13
Output
CH 3 (CH 4)
Compander Unit
ZM 0054
38,1 mm/s
J12/10
Cal 1
to MSW Switch
ZM 0052
V 8
J3/3
J3/4
J3/5
J1/11
J1/61
J1/6
J2/8
r-Cal. 2
J2/3
r(Ref+AC+DC)
J2/8
Record Control
Cal. 1
k
Q 2
Q 5
J2/2
+10 R 1
J12/17
CH 1
(CH 2-4)
Head
Driver
B
A
FM Unit ZM 0053
Record
Y(AC)
Int./
Ext.
Selector
B-Logic
Stop
Circuit
J1/10
J2/1
B
J2/11
J2/12
C
J2/12
J 11/8
Tape Transport 7005,2
Control Logic
ZM 0051
FM Unit ZM 0053
Reproduce



A-Weighting, Channel 3 (Channel 4)

Input signal to "Direct Input": 1 kHz adjusted to give 1000 mV at the socket J1 pin 6 (J1 pin 18).

INPUT ATT.: "1 V"
INPUT SWITCH: "Lin"
COMPANDER MODE: "Disable"
Drive Lever to "Drive Pos."
MODE SWITCH Ch. 3, Ch. 4: "Off"

Use Extension Board (AR 0176).

INPUT SWITCH to "A-Weight"

Check the voltage at the socket J1 pin 6 (J1 pin 18): 1000 ± 10 mV.
If necessary adjust P1 (P5).

Distortion

Input signal to "Direct Input": 1 V, 1 kHz.

INPUT SWITCH to "Lin"
COMPANDER MODE to "Normal"

Check the 2nd harmonic at the socket J1 pin 6 (J1 pin 18): min –60 dB re 1 V.
If necessary adjust P2 (P6).

Main Comp. Gain

Input signal to "Direct Input": 1 kHz adjusted to give 1000 mV at the socket J1 pin 6 (J1 pin 18).

COMPANDER MODE to "Disable"

COMPANDER MODE to "Normal"

Check the voltage at the J1 pin 6 (J1 pin 18): 1000 ± 10 mV.
If necessary adjust P3 (P7).

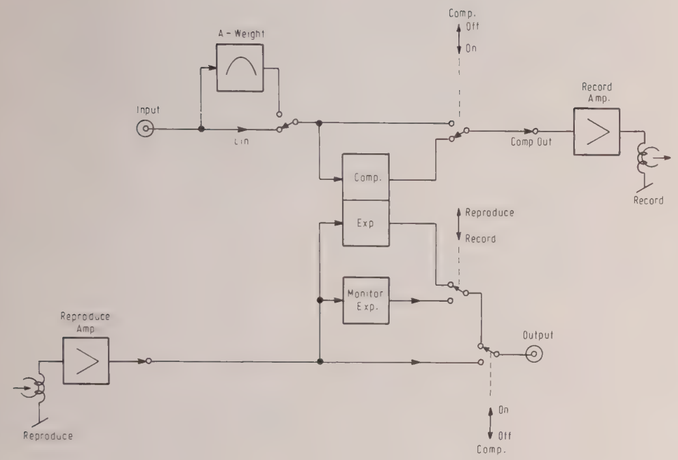
Monitor Exp. Gain

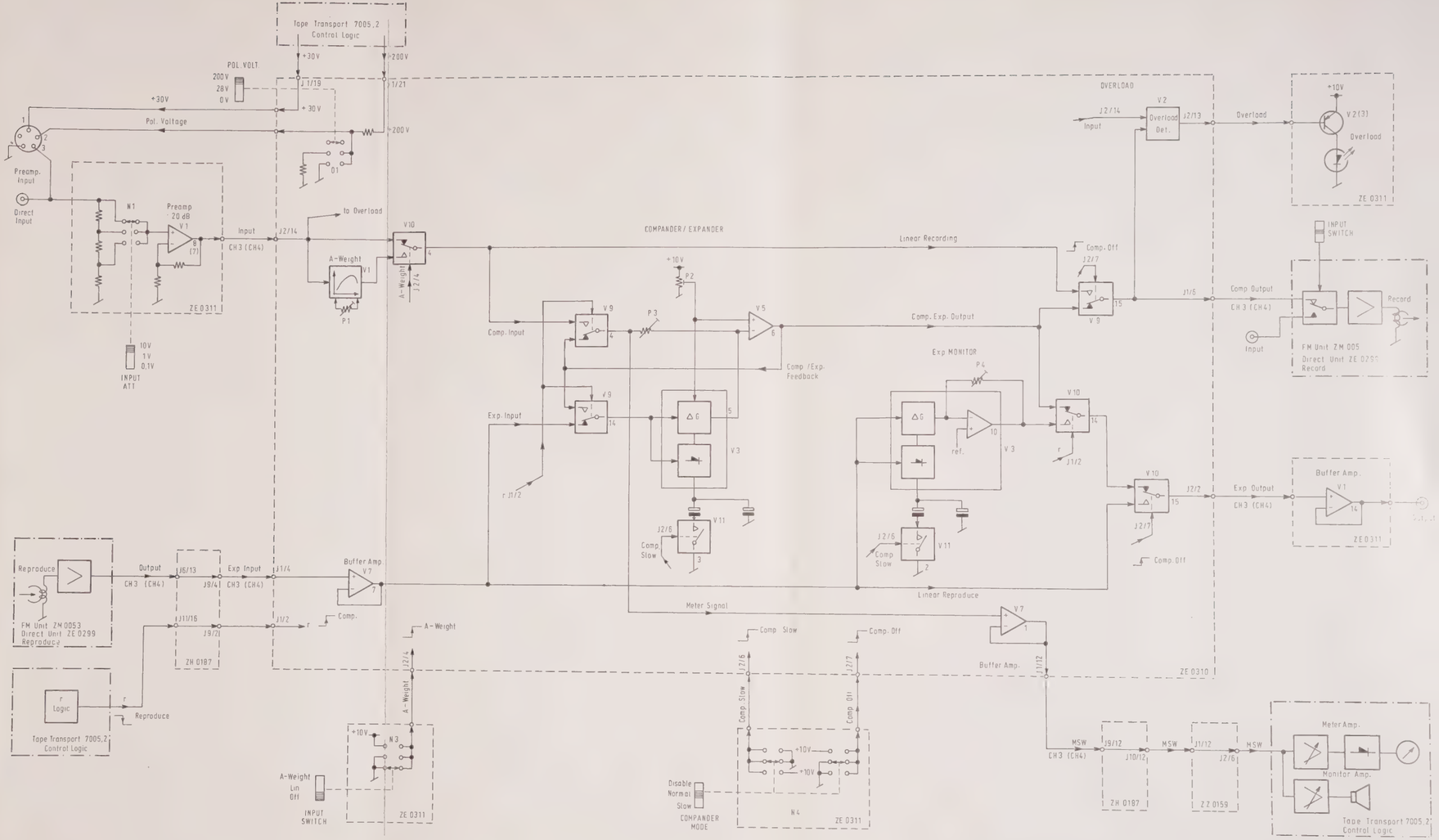
Check the "Output" voltages on the Compander Unit Ch. 3 (Ch. 4): 1000 ± 200 mV.
If necessary adjust "Var. Gain" on the Unit.

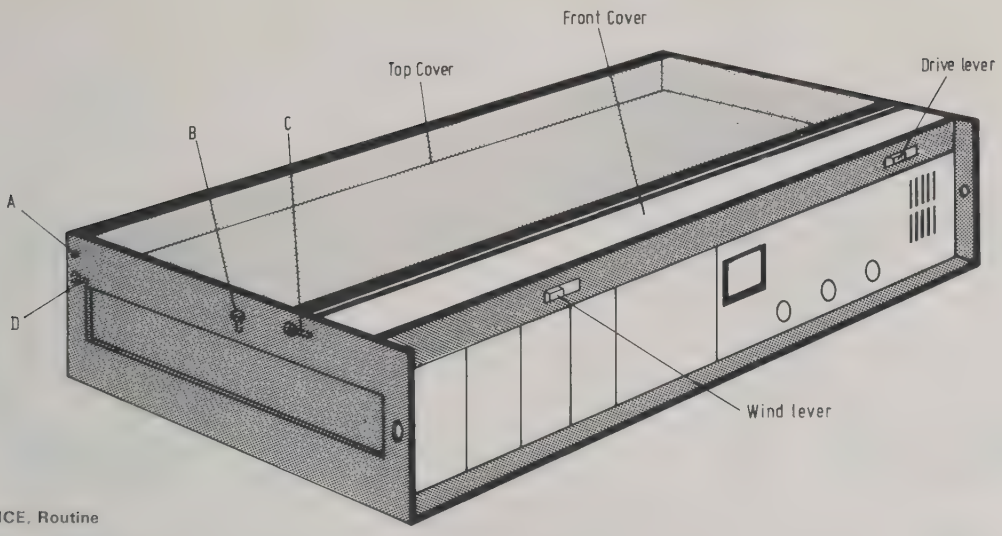
COMPANDER MODE to "Disable"
MODE SWITCH Ch. 3, Ch. 4 to "Ref."

COMPANDER MODE to "Normal"

Check the Compander "Output": 1000 ± 5 mV
If necessary adjust P4 (P8).


A-Weight
Lin
Input
Comp.
Off
On
Comp Out
Record Amp.
Record
Comp.
Exp
Monitor Exp.
Reproduce
Record
Reproduce Amp.
Reproduce
Output
On
Off
Comp.


Tape Transport 7005.2 Control Logic
+30V
+200V
POL VOLT
200V
28V
0V
J1/19
J1/21
Pol. Voltage
Preamp. Input
Direct Input
N1
Preamp 20 dB
V1
ZE 0311
INPUT ATT
10V
1V
0.1V
Input
CH3 (CH4)
J2/14
to Overload
A-Weight
P1
V10
COMPANDER/EXPANDER
Linear Recording
Comp. Off
Comp. Input
Exp. Input
Comp. Exp. Output
Comp./Exp. Feedback
Exp MONITOR
Linear Reproduce
Meter Signal
OVERLOAD
Overload
Overload Det.
ZE 0311
INPUT SWITCH
Comp Output
Record
FM Unit ZM 005
Direct Unit ZE 0299
Buffer Amp.
Exp Output
Reproduce
FM Unit ZM 0053
Direct Unit ZE 0299
Reproduce
Output
Exp Input
Comp.
ZH 0187
Logic
Reproduce
Tape Transport 7005.2 Control Logic
A-Weight
Lin
Off
INPUT SWITCH
N3
ZE 0311
Comp Slow
Comp. Off
N4
ZE 0311
Disable
Normal
Slow
COMPANDER MODE
MSW
Meter Amp.
Monitor Amp.
Tape Transport 7005.2 Control Logic
ZZ 0159
Compander Unit ZM 0054



MAINTENANCE, Routine

The tape heads should be kept strictly clean at all times. Remove loose dust and oxide particles from the head area with a soft brush. Clean the surfaces of the heads with a soft lint-free cloth dampened with head cleaner

Caution: Do not use excessive amounts of solvent. Use only enough to dampen the cloth

The capstans, pressure rollers and the guide rollers should be cleaned whenever there is any indication of dirt or oxide particles deposited on the surfaces. Use the same procedure as mentioned under the cleaning of the tape heads.

The entire tape deck compartment should be kept free from loose particles. The top hinged cover can be cleaned with a soft cloth dampened in water to which a small amount of mild soap is added. Finish with a clean soft cloth dampened in water.

MAINTENANCE, (Every six months, or if required)

Remove the rear cover and the battery pack. Unscrew bottom cover and swing out the main printed circuit board by loosening the three retaining screws

Remove all loose dust particles from the tape transport with a soft brush. Clean both sides of the capstan drive belt with a soft cloth dampened with head cleaner solvent or Freon TF. Place the cloth on both sides of the belt and carefully pull the belt along its normal path until a complete passage has been made

Care should be taken not to cause the belt to move excessive sideways as this will cause the sides of the belt to become damaged. The direction of pull should be such as to cause the center drive pulley to rotate counterclockwise seen from the bottom of the recorder.

Clean the peripheral surfaces of all belt pulleys with head cleaner or Freon TF.

DISASSEMBLY

The tape deck can be removed from the main frame as follows

Remove the top cover by inserting a wire of max. 1 mm (0.040") diameter through the holde "A". Push in the spring loaded pin and lift the cover free Disengage the pin at the other end. Take care not to loose the washers located on either pin

Turn the Drive lever to the "Drive" position in order to facilitate removal of the cover plate over the tape deck. Unscrew the two M2.5 × 6 screws "B", remove the two springs along each side plate. Slide the cover plate forward and lift up at the rear edge. Take care not to damage the small rollers which protrude through the cover. Release the Drive lever.

Remove the front cover by unscrewing the two M3 × 12 screws "C" five full turns Lift up the cover at the rear edge
Remove the Wind lever and the drive lever by unscrewing the two M3 × 10 hexagon screws using a 2,5 mm hexagon wrench.

Unplug the cable at the right side of the tape deck together with the screened cable plug Remove the rear cover by unscrewing four M2 × 5 screws. Unplug the cables from the drive motor and the tachometer at the rear printed circuit board

Remove the two M4 × 12 Supa Drive screws "D".
Loosen the two M3 × 8 hexagon screws holding the rear plate to the bottom profile five full turns using a 2 mm hexagon wrench

Remove the three screws holding the tape head assembly and place the head assembly along the top profile holding it in place with adhesive tape. Remove the compander unit

Remove the two M3 × 12 hexagon screws holding the tape deck at the rear and remove the two M3 × 16 hexagon screws holding the tape deck on each side Use a 2,5 mm hexagon wrench

Move the rear profile from the frame as far as the screws holding the rear plate will allow. Lift the tape deck at the rear until the bottom of the drive motor is clear of the rear profile. Then slide the tape deck towards the rear so the tape counter reset button is clear of the front plate. Lift up the tape deck taking care of the cables from the tape heads and from the drive motor and tachometer

ASSEMBLY

Reverse the procedure for disassembly. Take care to position the tape counter button in the hole in the front plate without exerting to great a force upon the button Position the cables from the drive motor and tachometer correctly with respect to the frame before lowering the tape deck into the frame
Check that the cables from the tape heads are free of the capstan drive wheels

Insert the rubber covered guide bushings into the holes in the tape deck (long bushing to either side, short bushing to the rear.) The height of the tape deck should be checked at both sides and at the rear. If an adjustment is necsasary remove or add a spacer. When installing the front cover take care to place the washer and spacer out towards the head of the screws
Check that the sheet metal guide, along side of the Compander Unit, does not touch the Compander.

ADJUSTMENTS The adjustment procedure marked with

A: Indicates that the adjustments can be carried out after removing the cover plate over the tape deck and the bottom plate.

B: Indicates that adjustments require the tape deck to be removed from the main frame. Refer to "Disassembly" for this procedure.

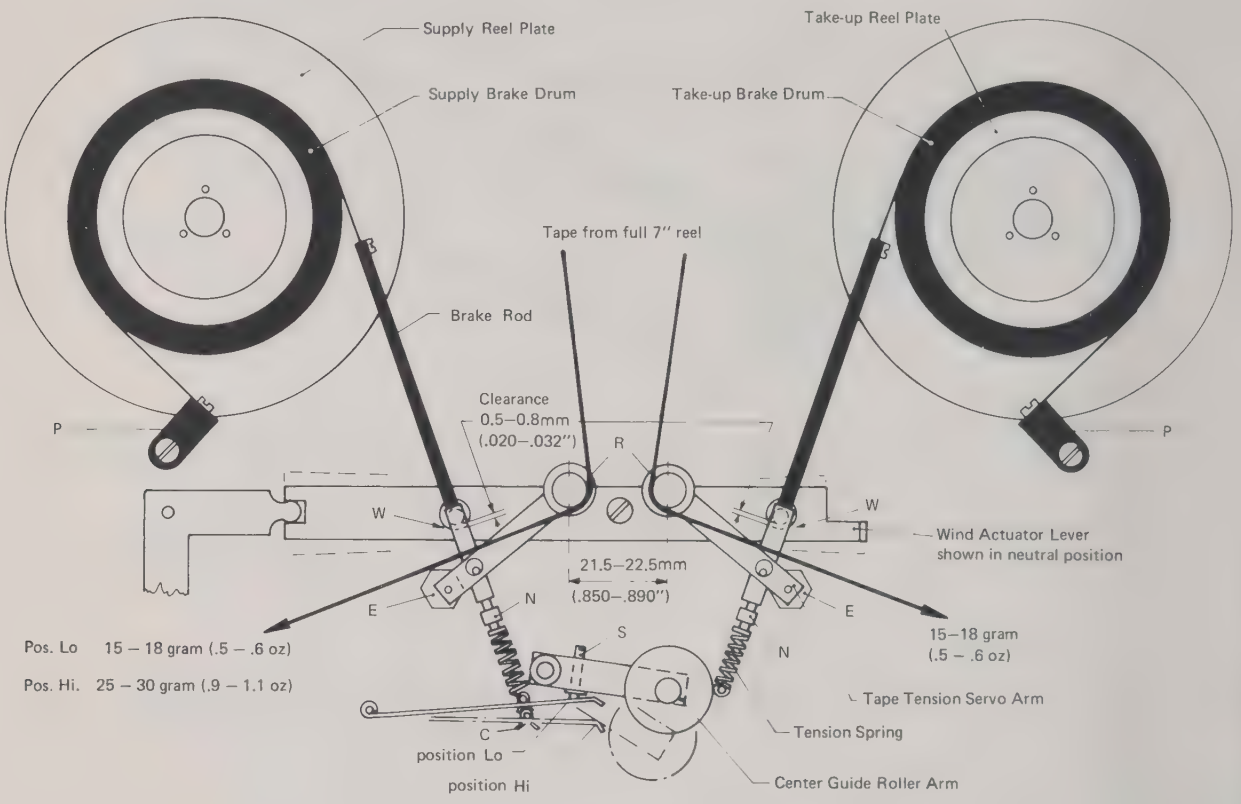


Fig.1

Top view

3.1. Tape Tension Rollers. "A"

On Fig.1 the tape tension rollers are marked "R". With the Wind lever in neutral position and without tape on the recorder, the rollers should be straight across from each other with a distance between the centers of 21,5 — 22,5 mm (0,850 — 0,890")

If adjustment is necessary, first check that the clearance at point "W" (between the stud on the brake rod and the hole in the wind actuator lever) is 0,5 — 0,8 mm (0,020 — 0,032")

The clearance can be adjusted by the position of the brake band support "P"

If the brake band support "P" does not need an adjustment then the distance between the rollers can be adjusted at the excentric bearing "E" The bearing is friction loaded and need not to be loosened Turn the bearing to either side using an 8 mm = (5/16") flat wrench

3.2. Supply Reel and Take-up Reel Brakes. "A"

Move Wind lever to either side and observe that the brake rod is moved 0,5 — 1 mm (0,02 — 0,040") by the wind actuator lever

There are two holdback tensions for the supply reel. These are governed by the position of the center guide roller arm
Position Lo gives the holdback tension for fast forward winding and position Hi gives the holdback tension for drive operation

Turn Drive lever to position "Drive" so center guide roller arm is in position Hi and place a full reel of tape on the supply reel spindle Make a small loop on the end of the tape so a spring scale can be attached
For a constant pull in the direction shown on Fig.1 the scale should read 25 — 30 gr (0,9 — 1,1 oz.)

If an adjustment is necessary turn nut "N" in for a higher tension and out for a lower tension As the nut is placed under the pinch roller arm the adjustment should be carried out by turning the spring at point "C" The scale reading will vary a bit dependent on how steady the pull is An average should be judged from the high and low readings

Release the Drive lever so the center guide roller is in position Lo and check the tension as for position Hi The scale should read 15 — 18 gr (0,5 — 0,6 oz.)
If an adjustment is necessary loosen nut on adjustment screw "S" and turn the screw in for a higher tension and out for a lower tension Tighten the nut again

There is only one holdback tension for the take up reel This holdback functions under rewind operation Turn the nut "N" until correct tension 15 — 18 gr (0,5 — 0,6 oz.) is obtained

If the brake action is not sufficient clean brake drums and brake linings with freon

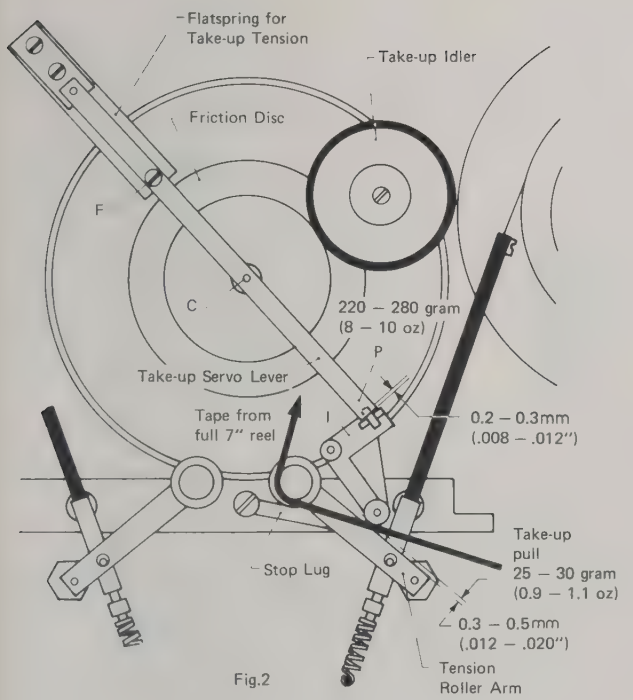


Fig.2

Top view

3.3. Take-up Tension. "A"

The take-up tension is servo controlled by the same tension roller which controls the holdback tension under rewind operation. The tension roller arm acts against an intermediate arm "I" which again acts against the take-up servo lever. The servo lever regulates the torque delivered by the center drive by varying the pressure exerted on the friction disc. The torque is transmitted to the take-up spindle by the take-up idler wheel.

Check the clearance between the small roller on the arm "I" and the side of the tension roller arm. It should be 0,3 — 0,5 mm (0,012 — 0,020"). If necessary move the stop lug to obtain correct clearance.

Then check the clearance between the other small roller on "I" and the bevelled surface of the take-up servo lever. Here the clearance should be 0,2 — 0,3 mm (0,008 — 0,012"). Adjustment is carried out by the screw "C". Use a 0,9 mm (0,035") hexagon wrench and lock the screw with lacquer or glue.

After the adjustment check the operation of the lever system by pushing the take-up tension roller towards the take-up reel. The take-up servo lever should be lifted high enough to relieve the pressure on the friction disc

Check the tension on the take-up servo lever at the point marked "P": 220 — 280 gr. (8 — 10 oz.).

Place a full reel of tape on the take-up spindle. Thread the tape around the tension roller as shown on Fig.2. Pull 0,5 m (1 1/2 ft) of tape from the reel. Attach the spring scale and start the recorder. Slowly allow the tape to be wound up on the reel. The scale should read 25 — 30 gr (0,9 — 1,1 oz.) otherwise adjust the screw "F". Use a 4 mm (5/32") wrench for the adjustment nut and lock the screw and nut with lacquer or glue

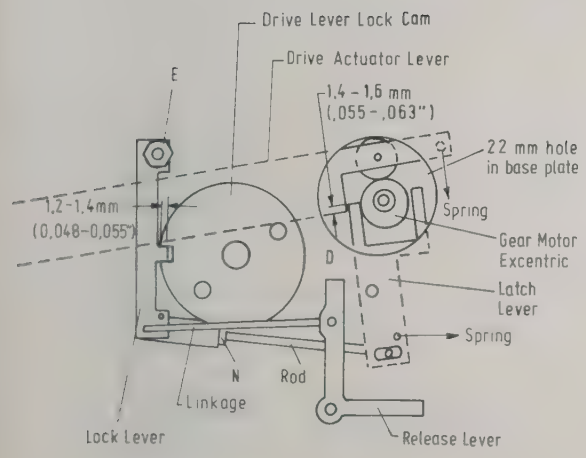


Fig. 3

3.4. Drive Function (Take-up Actuator). "A"

Upon initiation of DRIVE the gearmotor will rotate one revolution counterclockwise and lift the drive actuator lever from position "Ready" to position "Drive" (see Fig.4). It will be held in this position by the latch lever. This movement can also during adjustments be done by hand by merely pushing the drive actuator lever until the latch lever locks it in position. The latch lever is released by the RELEASE button and by the gear motor rotating one revolution clockwise when the STOP button is depressed

For proper action of the latch lever the distance measured at D (see Fig 3) should be 1,4 — 1,6 mm (.055 — .063"). To obtain this distance adjust the excentric bushing at point E

Fig 3 shows the lock lever engaged in the drive lever lock cam. The amount of engagement should be 1,2 — 1,4 mm (047 — .055"). This can be adjusted by bending the linkage between the lock lever and the release lever

For proper release action, the latch lever should release the drive actuator lever just before the lock lever releases the drive lever lock cam. If an adjustment is necessary, disconnect the rod at the latch lever by removing the retaining wings and loosen nut N. Lengthen or shorten rod for proper action

The travel of the take-up actuator rod is nominal 1,5 mm (.060"). This travel should move the take-up brake rod 0,7 — 1 mm (028 — 040") Check that the clearance at point T (see Fig 4) is 0,5 — 0,8 mm (020 — .032"). If not adjust small pad at screws D

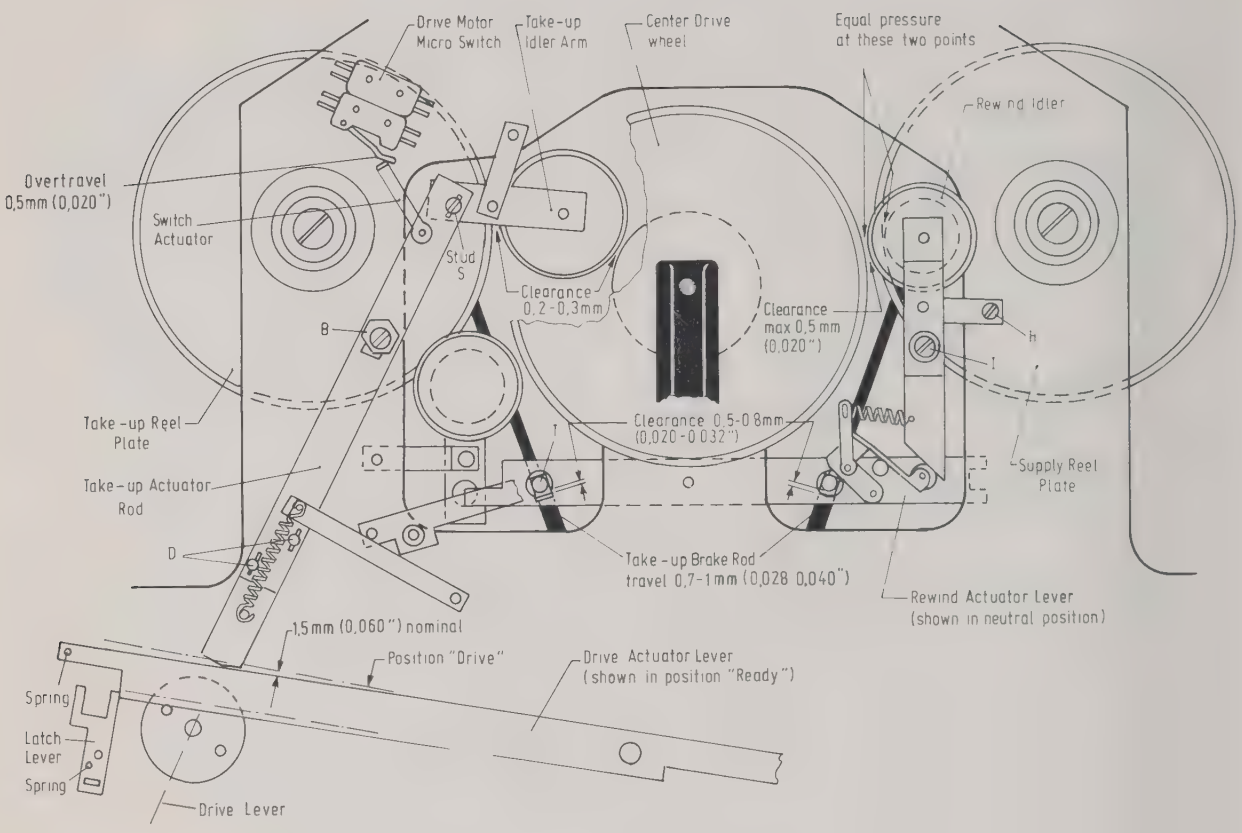


Fig. 4

3.5. Take-up and Rewind Idlers. "A"

The stud "S" (see Fig 4) which controls the take-up idler arm should be adjusted to a position giving 0,3 — 0,5 mm (0,012 — 0,020") clearance between the stud and the edge of the hole in idler arm. During adjustment the drive actuator lever should be in position "Drive". Use a 4 mm (5/32") wrench for the stud

In position "Ready" check that the idler wheel is free from touching the rim of the take-up reel plate and the core of the center drive wheel. To obtain the proper clearance adjust the excentric bushing at point "B". Use an 8 mm (5/16") wrench for the bushing

For proper rewind function the rewind idler wheel should contact the inside of the supply reel plate and the rim of the center drive pulley with equal pressure

Place the Wind lever in position "Rewind". Relieve the pressure on the idler wheel by pushing against the idler arm so the idler wheel just leaves the rim surfaces. Turn the center drive wheel slowly and allow the idler wheel to touch the rim. Observe that the idler wheel touches the two rim surfaces simultaneously. If an adjustment is necessary loosen the screw "H" and reposition the idler assembly

With the Wind lever in neutral there should be 0,3 — 0,8 mm (0,012 — 0,032") clearance between the idler wheel and the rim of the center drive. If an adjustment is necessary loosen the screw "I" and reposition the extension of the idler arm

3.6. Gear Motor Limit Switch, "B"

On Fig 5 the switch is shown with the low part of the cam of the gear motor facing towards the switch. This is the normal stop position. In this position and with the Drive lever in position "Drive" the switch actuator lever should rest against the gear motor support lever

Using a 1,5 mm (0,060") hexagon wrench as a gauge move the switch actuator level 1,5 mm towards the switch. This should close the switch

An audiable click can be heard when the switch is closed. Now slowly allow the switch actuator lever to move outwards from the switch. Again a click should be heard at a point 0,2 — 0,3 mm (0,008 — 0,012") before the switch actuator lever rests against the gear motor support lever

If an adjustment is necessary reposition the switch or carefully bend the switch actuator lever with a pair of flat nose pliers

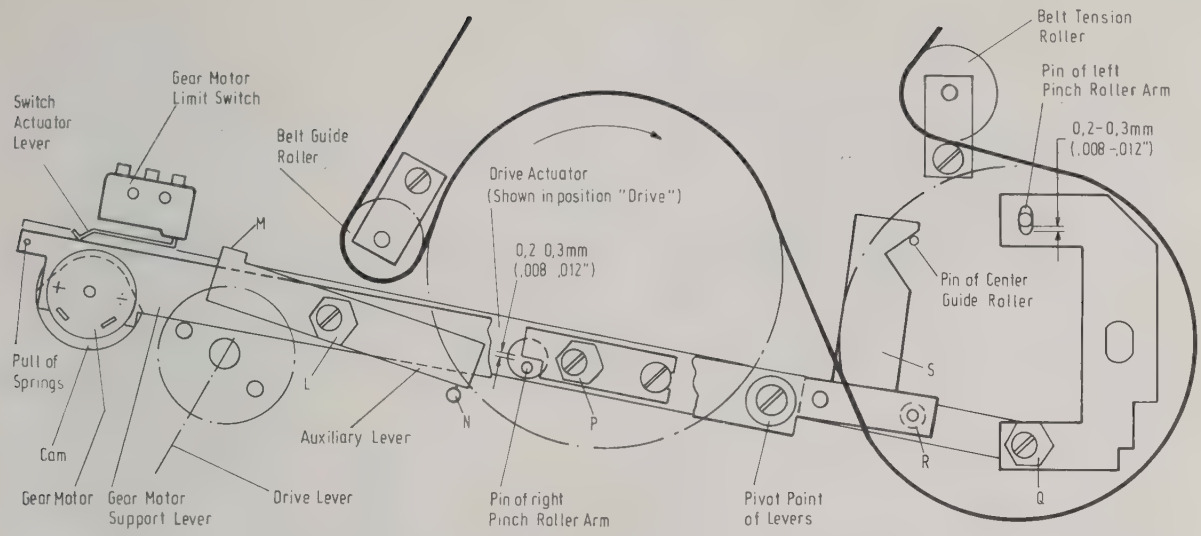


Fig.5

3.7. Pinch Roller Travel, "B"

The auxiliarey lever located on the gear motor support lever must be so adjusted that it contacts the drive actuator lever at "M" and the pin "N" firmly when the Drive lever is in neutral position. An adjustment can be made at the excentric bushing "L". Use an 8 mm (5/16") flat wrench for this adjustment

With the auxiliary lever correctly adjusted both the drive actuator lever and the gear motor support lever will be held firmly against the two pins of the Drive lever shaft in neutral position by the two coil springs.

The drive actuator lever governs the travel of both the left and the right pinch roller. When moved to position "Ready" by the Drive lever there will be approx. 0,3 mm (0,012") clearance between the pinch rollers and their respective capstan. When moved to position "Drive" through the action of the gear motor the pinch rollers will contact the capstans.

The pins of the pinch roller arms which protrude through holes in the base plate should in position "Drive" have 0,2 — 0,3 mm (0,008 — 0,012") clearance to the levers acting against them. Adjustments can be carried out by the excentric bushings "P" and "Q". Use an 8 mm (5/16") flat wrench for this adjustment.

3.8. Center Guide Roller Travel "B"

Movement of the center guide roller to a position between the two magnetic heads is accomplished by the lever marked "S" on Fig.5. When the gear motor support lever is moved by the Drive lever the lever "S" acts upon the pin from the center guide roller which protrudes through the base plate

The guide roller should be held firmly in the advanced position. The pressure against the limit stop should be approx. 120 gr. (4 1/2 ox.). This can be measured using a spring scale with a string around the center guide roller
If an adjustment is necessary turn the excentric bushing "R" using an 8 mm (5/16") flat wrench

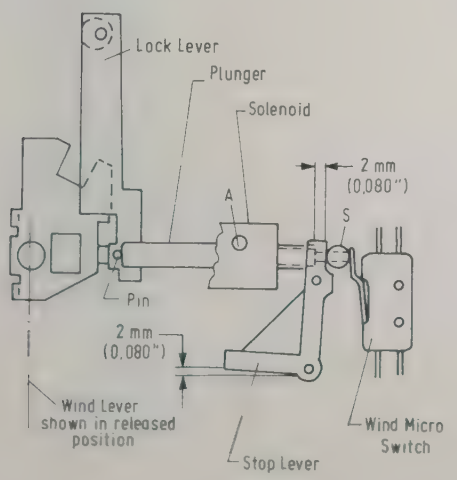


Fig. 6

3.9. Wind Stop Function "B"

Stop of wind function is accomplished by either depressing the STOP button or by, activating the stop solenoid. The solenoid plunger travels 2 mm (.080"). Stud "S" (see Fig.6) limits the plungers travel. It can be adjusted by loosening the hexagon set screw using a 0,91 mm hexagon wrench

The solenoid should be positioned so the stop lever is tilted 2 mm (.080") from perpendicular position. Loosen two screws marked A for this adjustment. Check that the pin at the end of the plunger can move the lock lever enough to release the wind lever. Bend the pin or reposition the solenoid if an adjustment is necessary. The wind micro switch as shown in Fig.6 is positioned against stud "S" so the contacts are closed plus an overtravel of approx. 0,2 mm (.008"). Check that the contacts open when the wind level is activated

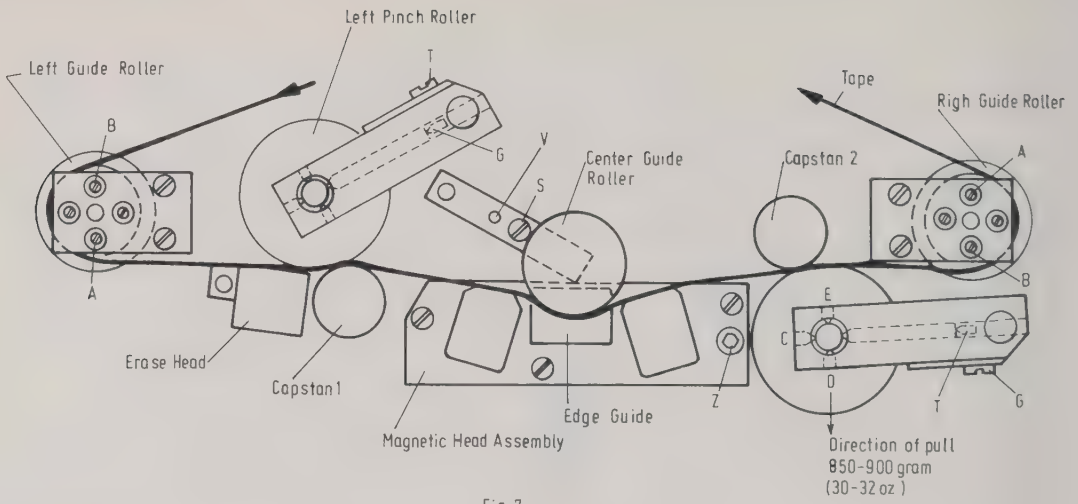


Fig.7

3.10. Magnetic Head Assembly. "A"

The head assembly may be removed from the tape deck without loss of track height adjustment or azimuth adjustment. Disconnect the two cable plugs and unscrew the three retaining screws.

When remounting the head assembly care should be taken that the mounting surfaces are strictly clean.
Adjustment of the reproduce head and check of the tape transport is carried out as follows

Record a signal 10 kHz, 1 V on channel 1 and 4 simultaneously at a tape speed of 381 mm/s

Connect a dual beam oscilloscope to the outputs of channel 1 and 4 and check the phase difference between the two channels

Average difference: 0 ± 5°
Max difference: 30°

Before any adjustment move the left or the right pinch roller away from the capstan. If this results in a better phase relationship check 3.12 Pinch Rollers.

In case that the phase difference is independent of the pinch rollers adjust screw "Z" slightly. The correct position of the screw should not depart more than ± 15° turn off the position set at the factory. If the phase difference can not be obtained check 3.11 Guide Rollers.

3.11. Guide Rollers. "A"

The left and right guide rollers are furnished with a single edge guide. For correct tracking the tape should always be in close contact with the edge guide of the two rollers
The height of the edge guide above the base plate is carefully set at the factory and should not be disturbed.

Run some tape in FAST FORWARD position and observe how the tape is guided by the guide rollers. A slight bulge on the edge of the tape should be seen where the tape leaves the roller. If the tape does not contact the edge guide, check that the tape is threaded correctly at the tape tension rollers

If the tape is to be brought closer to the edge guide an adjustment of the tilt of the guide roller is necessary. Remove the plastic cover on top of the roller support. Loosen screw "A" 5 — 10° (see Fig.7) Tighten screw "B" the same amount. It should not be attempted to turn the screws more than 20° from the original position. The two remaining screws should not be touched

If the tape contacts the edge guide too heavily, which can be seen as a large bulge on the edge of the tape, the above adjustment procedure should be reversed
The center guide roller is tilted slightly in order to keep the tape edge in constant contact with the fixed edge guide located between the two magnetic heads

Loosen screw "V" using a 1,5 mm (.080") wrench. Turn screw "S" on the arm supporting the roller clockwise if the tape is to be brought in closer contact with the guide Tighten screw "V" again. This adjustment should only be made after having checked that the two pinch rollers are correctly adjusted, see 3.12 Pinch Rollers.

Whenever the guide rollers are adjusted check 3.10 Magnetic Head Assembly

3.12. Pinch Rollers. "A"

The left and right pinch roller assemblies can readily be removed for inspection or replacement With the Drive lever in neutral position loosen the screw "T" using a 2,5 mm (.100") hexagon wrench (Fig.7) and pull the entire assembly upwards. When replacing the assembly make sure to engage the release pin, which protrudes through the base plate, with the hole in the release lever

Place the Drive lever in position "Drive" and measure the pull required to move the pinch roller slightly Attach a spring scale in the socket screw "E" and tighten the screw "T" in a position giving a tension 850 – 900 gr (30 — 32 oz). Then move the pinch roller arm by hand to ascertain that they do not bind

To align the pinch roller parallel to the capstan, loosen the erase head and place a suitable light source at the capstan and observe the narrow beam of light Press the roller towards the capstan to make the light beam more narrow If there is an unequal amount of light along the line of contact, adjust either screw "D" or "E" using a 1,27 mm (0,050") hexagon wrench

Run some tape on the recorder at a speed at 381 mm/s. Move the pinch roller momentarily away from the capstan by hand. Observe if the tape moves sideways where it leaves the capstan with the pinch roller engaged or disengaged. If the tape moves more than 0,2 mm (0,008") upwards turn the screw "G" 20° out and turn the screw "C" an equal amount in Repeat the adjustment if necessary. Do not, however, exceed more than 60° turn of the screws from their original position. If the tape still moves sideways it might be caused by a defective roller (curved surface) and a replacement of the roller is necessary

After adjustment of the pinch roller fasten the erase head with a distance of 0,3 — 0,5 mm (0,012 — 0,020") from the left roller when the roller is held against the capstan

Whenever adjustment of the pinch rollers are carried out check 3.10 Magnetic Head Assembly

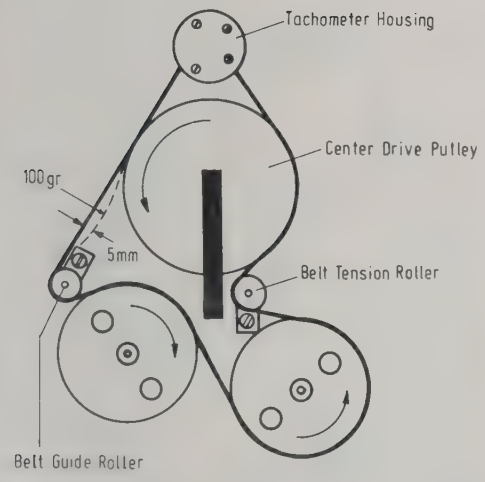


Fig 8

3.13. Capstan Belt Drive. "A"

If it should become necessary to remove the capstan drive belt proceed in the following manner:

Loosen the belt tension roller to make the belt slack

Remove the cover of the tachometer by unscrewing the four retaining screws. Note how the signal leads from the tachometer coil leaves the housing

Remove the belt from the capstan pulleys and slide the belt carefully out of the tachometer housing along the inside edge while making a large loop in order to pass the toothed disc.

The belt tension can be adjusted at the belt tension roller. With 100 gr. (3 1/2 ox.) pressure against the belt applied midways between the belt guide roller and the center drive pulley, the belt should deflect 5 mm (0,200"). See Fig. 8

The correct guiding of the belt upon the three large pulleys is mainly done by the small belt guide roller, which has a crowned surface. Tilting the arm away from the base plate will cause the belt to move closer to the base plate. It is important that the belt is rotated in the correct direction while making this adjustment. Do not attempt to tilt the arm holding the belt tension roller.

The correct belt position can be seen on the center pulley. The edge of the belt should be 0,3 — 0,8 mm (0,012 — 0,032") inside the edge of the pulley facing away from the base plate

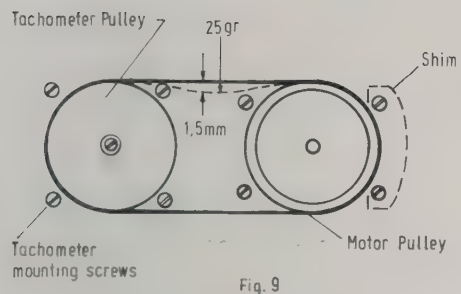


Fig. 9

3.14. Motor Drive Belt. "A"

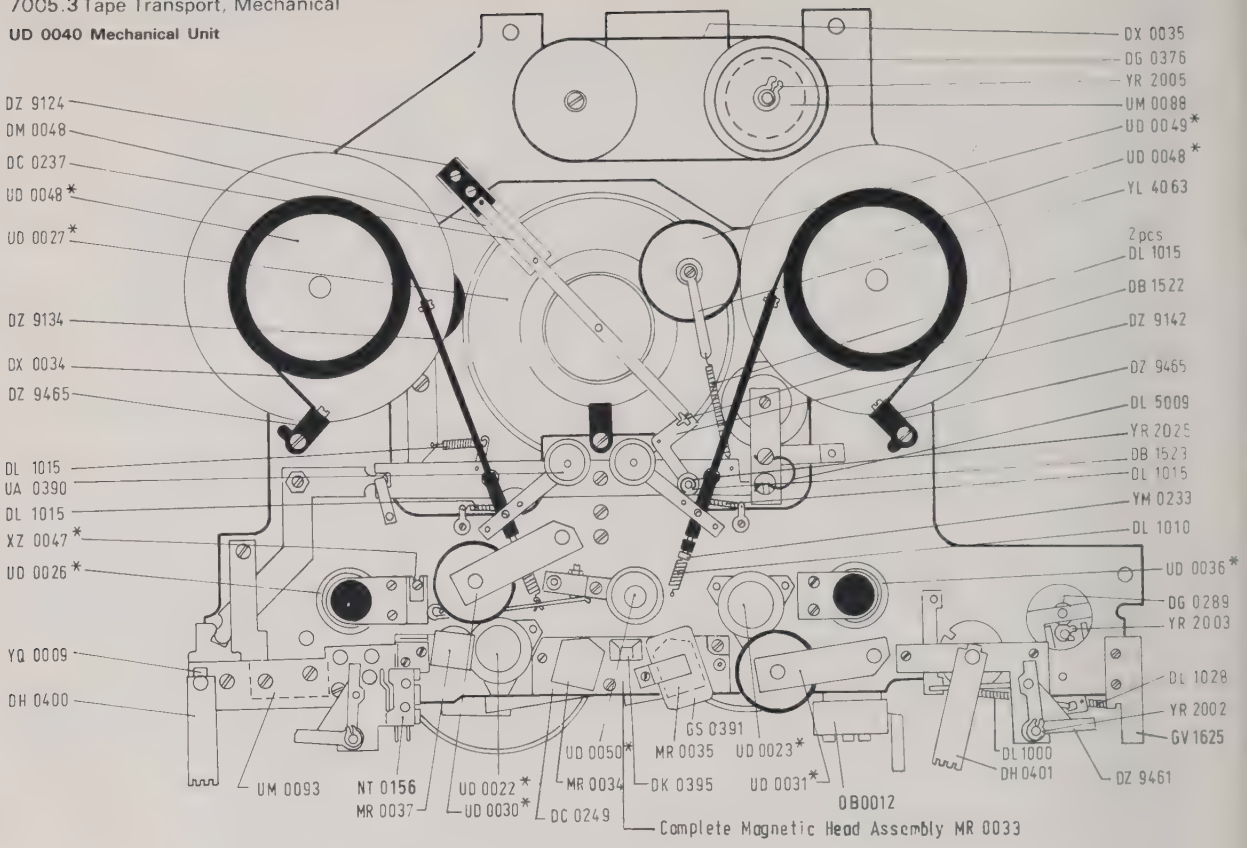
The belt can be removed by carefully guiding the belt off the edge of the pulleys while slowly rotating these. Note how the belt is orientated with respect to the base plate. Turning the belt upside down might cause the belt to travel incorrectly on the pulleys when it again is placed on the pulleys.

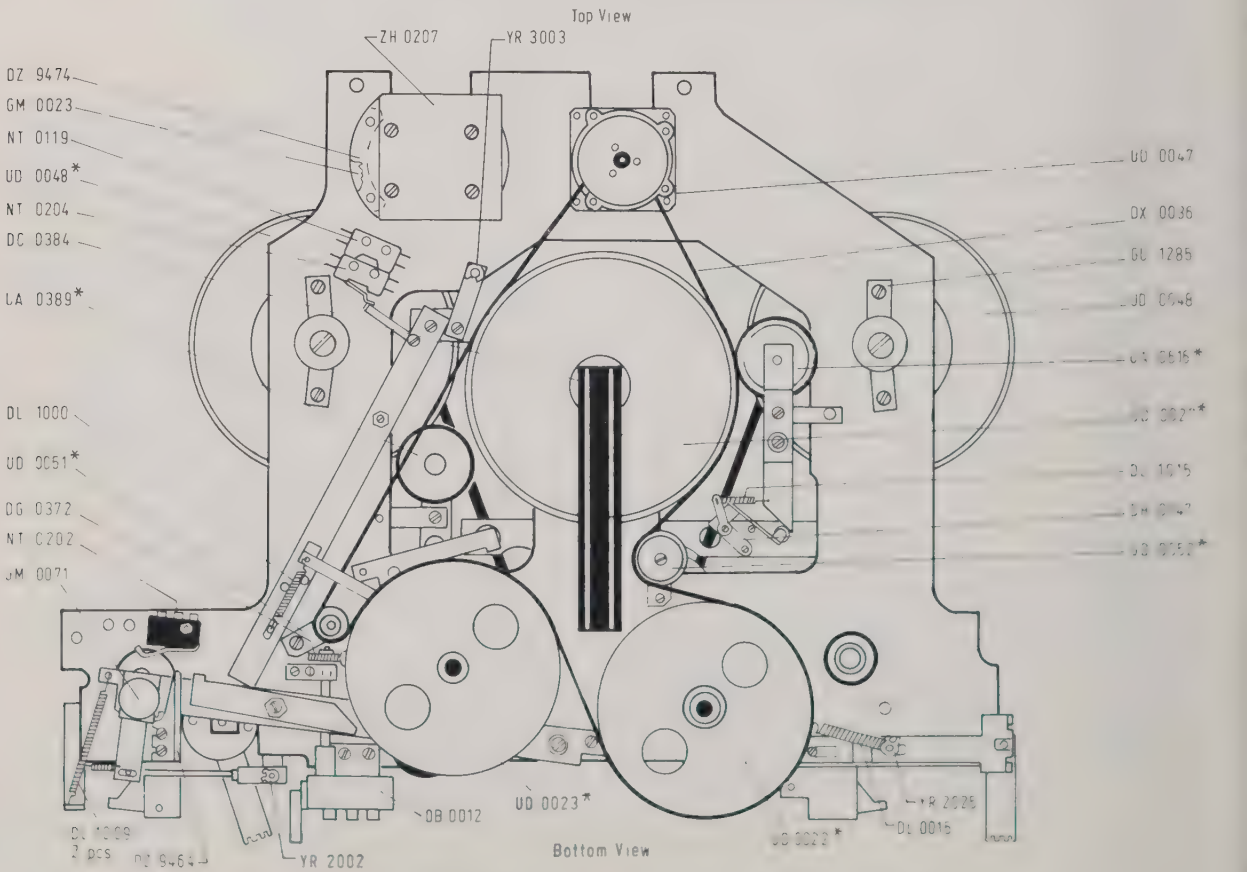
The correct belt tension can be measured as illustrated on Fig.9. With 25 gr. (0,9 oz) pressure against the belt applied midways between the two pulleys, the belt should deflect 1,5 mm (0,060"). The belt tension can be adjusted by loosening the four screws holding the tachometer housing and moving the housing to obtain correct tension. The motor housing can be moved also if necessary

The guiding of the belt is accomplished by both pulleys as they both have a crowned surface

If a new belt is to be installed it may be necessary to try turning the belt upside down in order to keep the belt running correctly on the pulleys. If necessary add or remove a shim located between the motor housing and the base plate at the side away from the tachometer

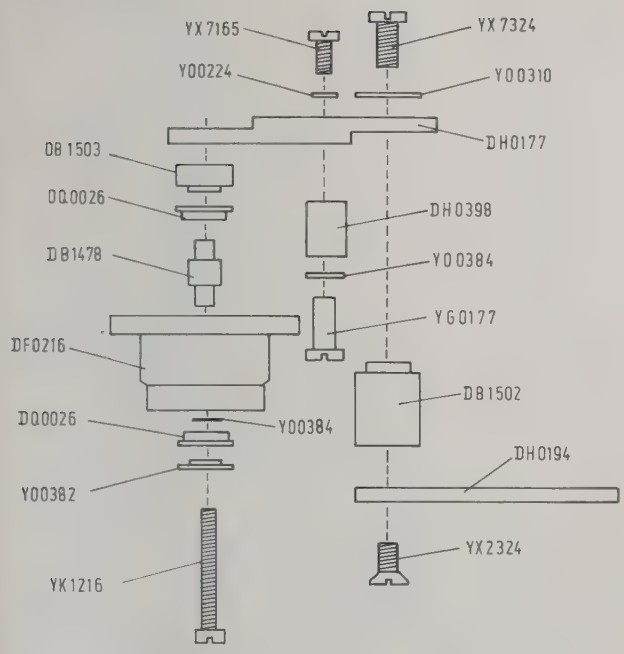
UD 0040 Mechanical Unit



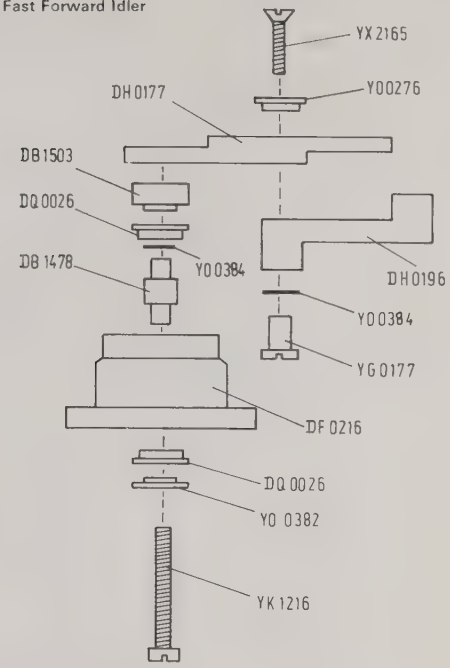


Parts marked * are complete units Detailed drawings on the following pages

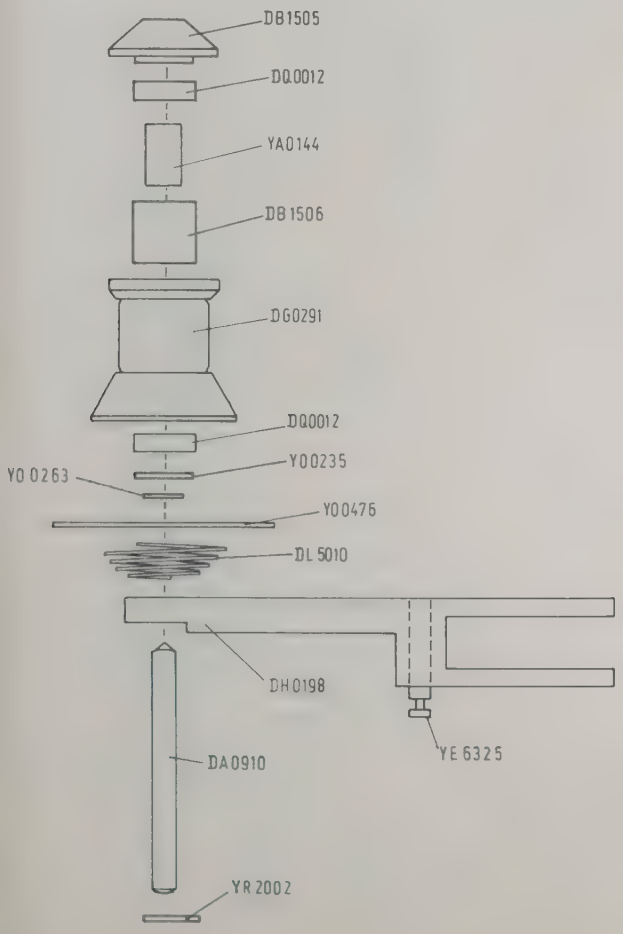
UA 0616 Rewind Idler



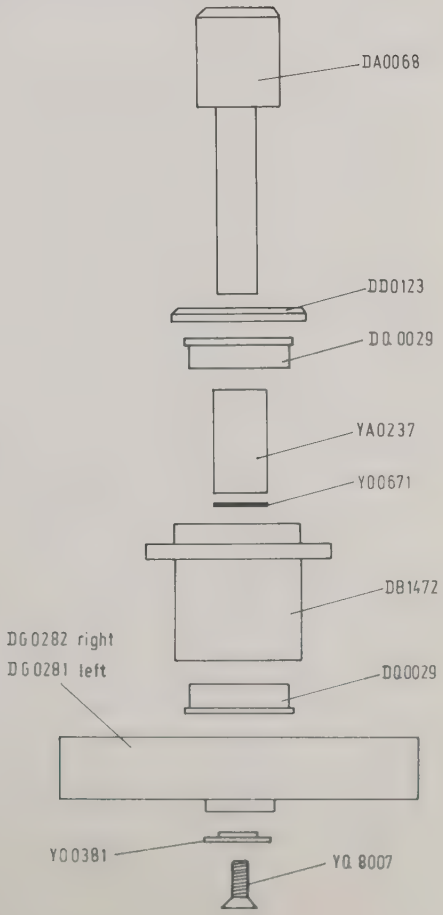
UA 0389 Fast Forward Idler



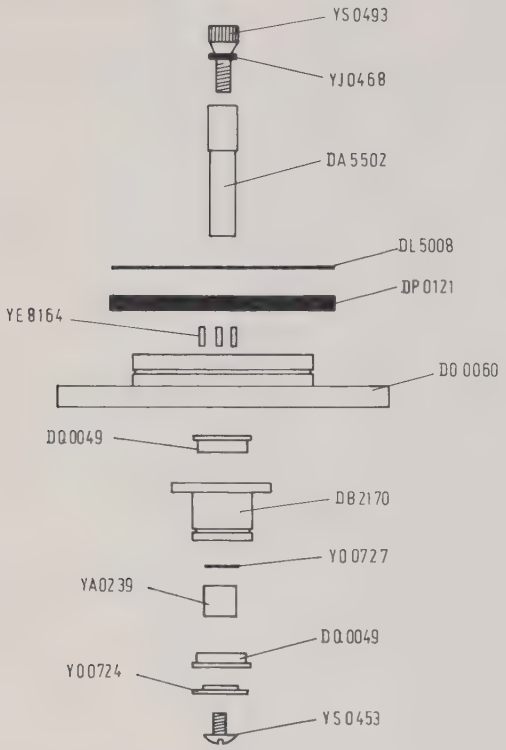
UA 0390 Tape Tension Roller



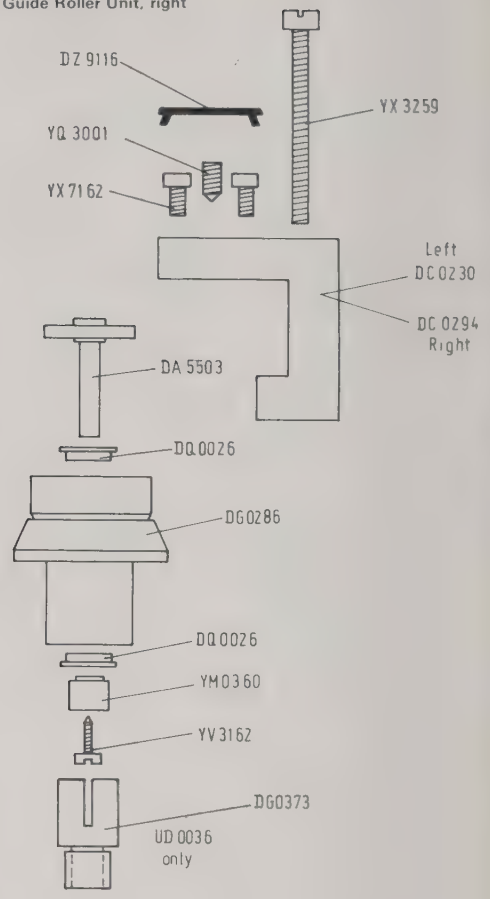
UD 0022 Capstan Unit, left
UD 0023 Capstan Unit, right



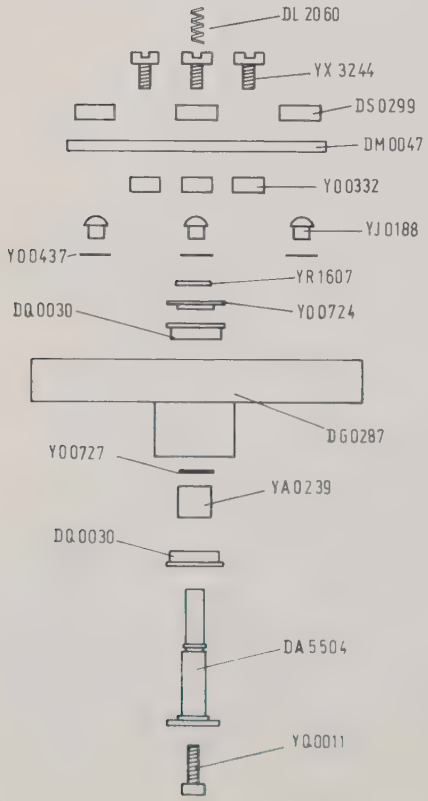
UD 0048 Reel Flange Unit

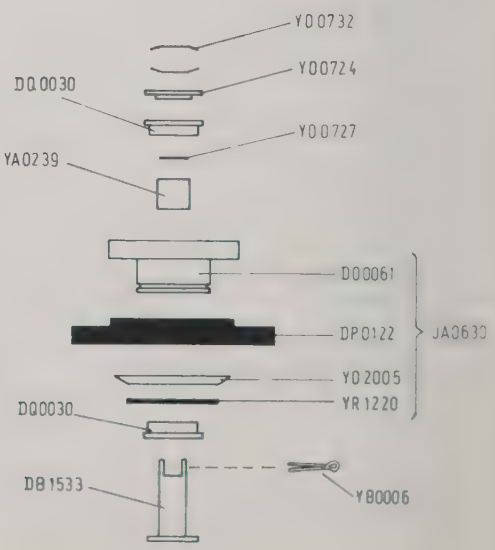


UD 0026 Guide Roller Unit, left
UD 0036 Guide Roller Unit, right

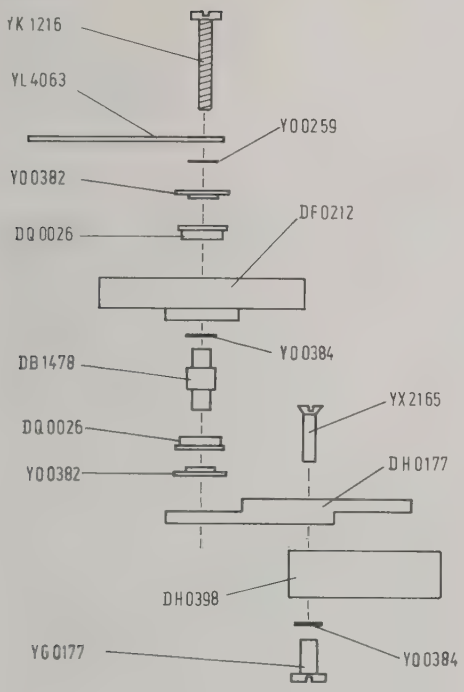


UD 0027 Center Drive Unit

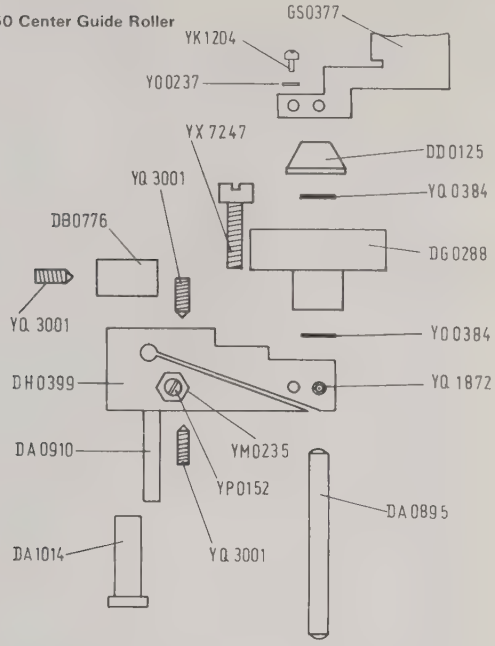




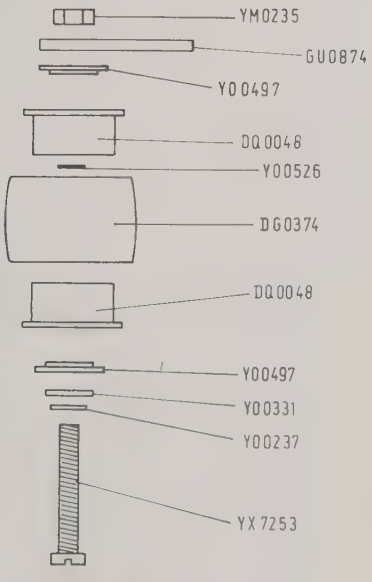
UD 0049 Take-up Idler Unit



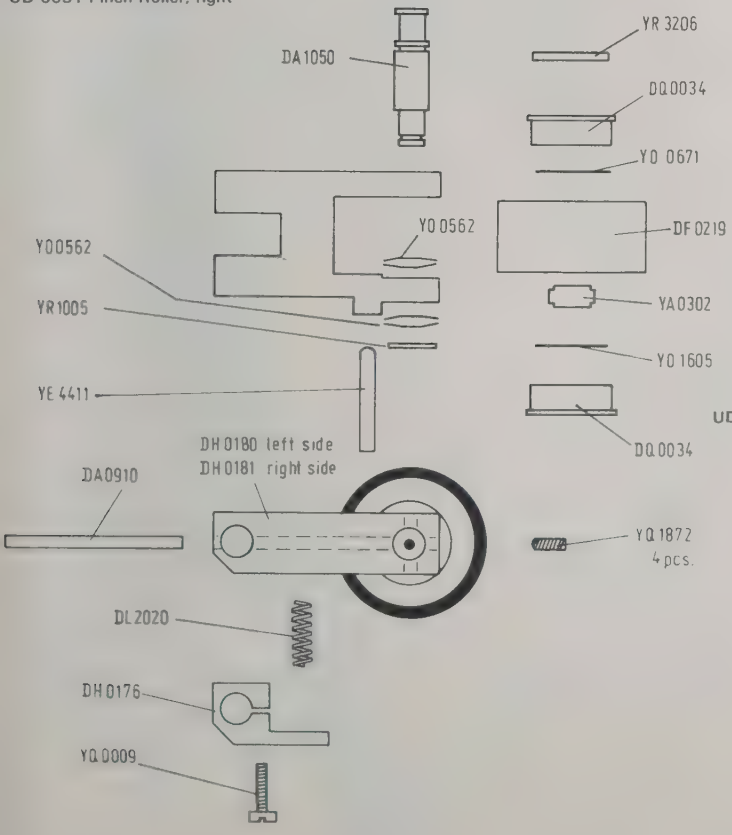
UD 0050 Center Guide Roller



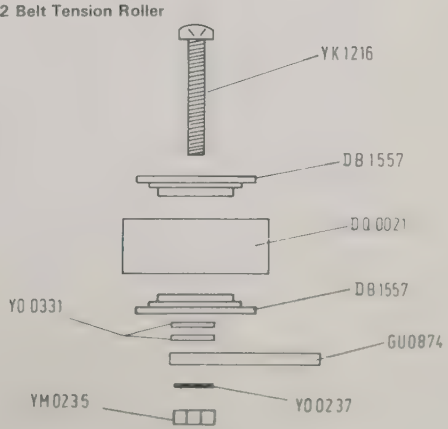
UD 0051 Belt Guide Roller

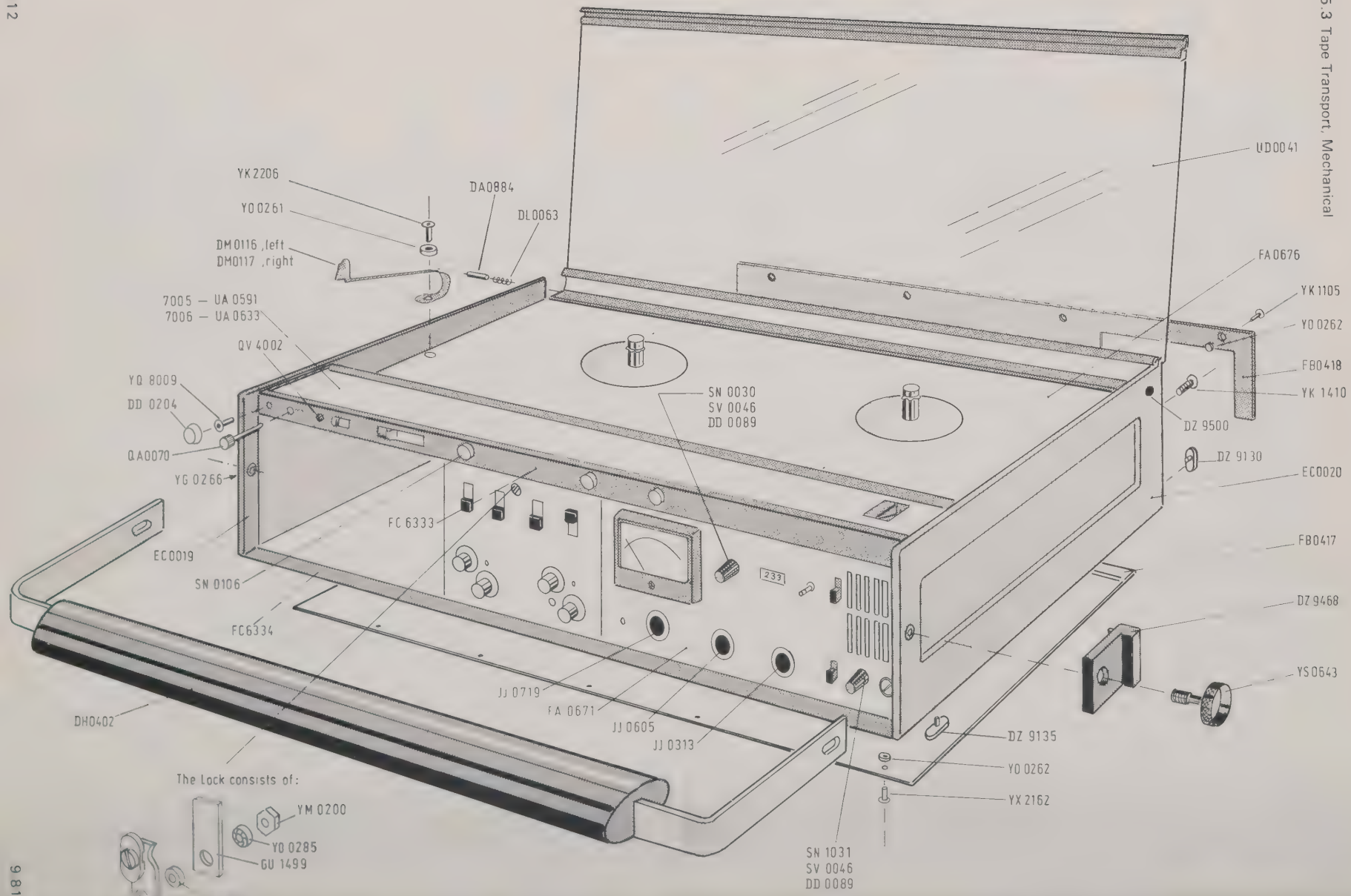


UD 0030 Pinch Roller, left
UD 0031 Pinch Roller, right



UD 0052 Belt Tension Roller



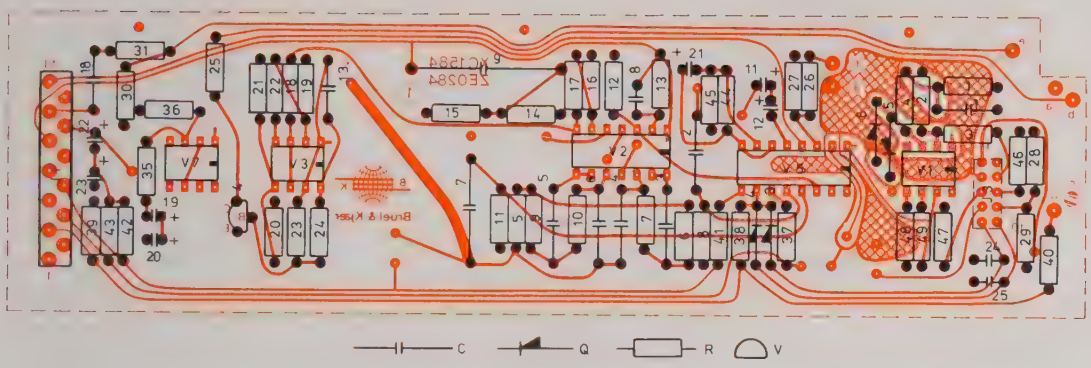

YK2206
YO0261
DM0116 ,left
DM0117 ,right
DA0884
DL0063
UD0041
FA0676
YK1105
YO0262
FB0418
YK1410
DZ9500
DZ9130
EC0020
FB0417
DZ9468
YS0643
DZ9135
YO0262
YX2162
7005 — UA0591
7006 — UA0633
QV4002
YQ8009
DD0204
QA0070
YG0266
EC0019
SN0106
FC6334
FC6333
SN0030
SV0046
DD0089
233
JJ0719
FA0671
JJ0605
JJ0313
DH0402
SN1031
SV0046
DD0089
The Lock consists of:
YM0200
YO0285
GU1499
YO0262

Direct Unit

ZE 0299

Record ZE 0284

LAYOUT DIAGRAM/PARTS LIST



Viewed from the component side

Note. Add 800 to all position numbers

C 1	Polyester		0,1 µF/100 V	CS 0436
C 2	Polystyrene		910 pF/ 63 V	CT 1147
C 3	·	1%	620 pF/125 V	CT 1109
C 4	·	1%	100 pF/125 V	CT 1133
C 5		1%	2,2 nF/ 63 V	CT 1126
C 6		1%	470 pF/125 V	CT 1111
C 7	·	1%	8,2 nF/ 63 V	CT 1556
C 8	Ceramic		82 pF/400 V	CK 1822
C 9	Polyester		1 µF/ 63 V	CS 0804
C 11,12	Tantalum		15 µF/ 16 V	CF 0028
C 13	Polyester		68 nF/100 V	CS 0435
C 18	·		0,1 µF/100 V	CS 0436
C 19,20	Tantalum		4,7 µF/ 10 V	CF 0018
C 21	·		3,3 µF/ 16 V	CF 0014
C 22,23	·		10 µF/ 16 V	CF 0059
C 24, 25	Ceramic		4,7 nF/ 30 V	CK 3473
J 1	13-pin Plug			JP 1301
Q 3,4	Si. 1N4148		75 V/75 mA	QV 0216
Q 5,6	FDH300		150 V/200 mA	QV 0242

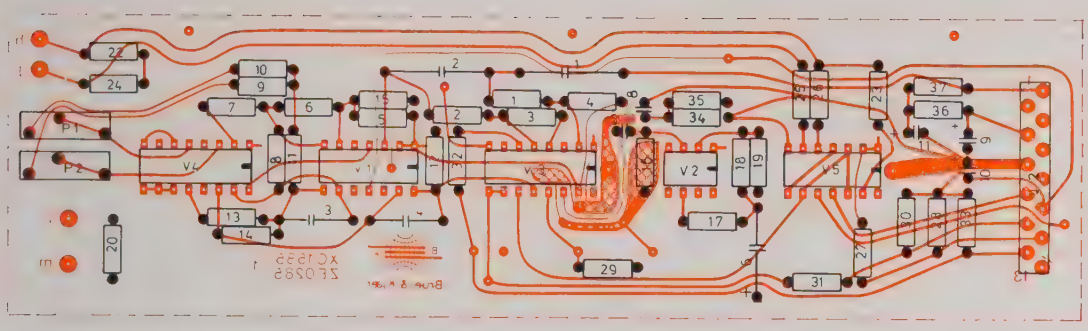
R 1	Carbon	1/4 W	10%	2,7 MΩ	RB 6270
R 2	Metal		1%	11,0 kΩ	RF 4110
R 3			·	20,5 kΩ	RF 4205
R 4	Carbon	·	5%	15 kΩ	RB 4150
R 5	Metal	-	1%	102 kΩ	RF 5102
R 6				4,87 kΩ	RF 3487
R 7		·	·	10,2 kΩ	RF 4102
R 8				2,49 kΩ	RF 3249
R 9				14,3 kΩ	RF 4143
R 10		·		25,5 kΩ	RF 4255
R 11				2,49 kΩ	RF 3249
R 12				78,7 kΩ	RF 4787
R 13	Carbon		5%	10 kΩ	RB 4100
R 14	Metal		1%	15,4 kΩ	RF 4154
R 15	Carbon		5%	1,0 MΩ	RB 6100

R 16	Metal	1/4 W	1%	20,0 kΩ	RF 4200
R 17	·	·	·	43,2 kΩ	RF 4432
R 18	·	·	·	25,5 kΩ	RF 4255
R 19	·	·		28,7 kΩ	RF 4287
R 20	·	·	·	165 kΩ	RF 5165
R 21	·	·	·	30,1 kΩ	RF 4301
R 22	·	·	·	165 kΩ	RF 5165
R 23	Carbon	·	5%	470 kΩ	RB 5470
R 24	·	·	10%	4,7 MΩ	RB 6470
R 25	·	·	5%	1,8 kΩ	RB 3180
R 26	Metal	·	1%	1,02 kΩ	RF 3102
R 27	·	·	·	4,02 kΩ	RF 3402
R 28	·	·	·	1,07 kΩ	RF 3107
R 29	·	·	·	24,9 kΩ	RF 4249
R 30	·	·	·	402 Ω	RF 2402
R 31	·	·	·	11,0 kΩ	RF 4110
R 35		·	·	78,7 kΩ	RF 4787
R 36	·	·	·	26,7 kΩ	RF 4267
R 37,38	Carbon	·	5%	22 kΩ	RB 4220
R 39		·	·	100 kΩ	RB 5100
R 40	Metal	·	1%	2,00 kΩ	RF 3200
R 41	Carbon	·	5%	22 kΩ	RB 4220
R 42-45	·	·	·	100 kΩ	RB 5100
R 46	Metal		1%	3,01 kΩ	RF 3301
R 47	·	·	·	49,9 kΩ	RF 4499
R 48	·	·	·	40,2 kΩ	RF 4402
R 49	·	·		140 kΩ	RF 5140

V 1	Op. Amp	TL072	VE 0146
V 2	· ·	TL064	VE 0151
V 3	Comparator	LM393	VE 0163
V 4	Darlington	MPSA63	VB 0133
V 5	3 × 2 Ch. Mult./Demult	CD4053	VD 2087
V 7	Op. Amp	TL061	VE 0135

8-pin Socket	JJ 0817
14-pin Socket	JJ 1416
16-pin Socket	JJ 1631
Printed Circuit Board	XC 1584

ZE 0284



Viewed from the component side

Note. Add 900 to all position numbers

C 1,2	Polystyrene	1%	33 nF/ 63 V	CT 1577
C 3,4	"	1%	300 pF/125 V	CT 1112
C 5	Tantalum		15 µF/ 16 V	CF 0028
C 6	Electrolytic		47 µF/ 10 V	CE 0204
C 8	Tantalum		3,3 µF/ 16 V	CF 0014
C 9 11			10 µF/ 16 V	CF 0059
J 2	13-pin Plug			JP 1301
P 1 2	Cermet		20 kΩ	PG 3206
R 1	Metal	1/4 W	1%	34,8 kΩ	RF 4348
R 2	"	"	"	402 kΩ	RF 5402
R 3	"	"	"	576 kΩ	RF 5576
R 4				38,3 kΩ	RF 4383
R 5				11,8 kΩ	RF 4118
R 6		"		10,0 kΩ	RF 4100
R 7		"		9,53 kΩ	RF 3953
R 8		"		86,6 kΩ	RF 4866
R 9				1,43 kΩ	RF 3143
R 10				3,16 kΩ	RF 3316
R 11		"		24,9 kΩ	RF 4249
R 12				10,0 kΩ	RF 4100
R 13				9,53 kΩ	RF 3953
R 14				86,6 kΩ	RF 4866
R 15				68,1 kΩ	RF 4681
R 16				10,2 kΩ	RF 4102
R 17	Carbon	1/4 W	5%	100 Ω	RB 2100
R 18	Metal	"	1%	38,3 kΩ	RF 4383
R 19	"	"	"	10,0 kΩ	RF 4100
R 20	Carbon		5%	10 kΩ	RB 4100
R 22	"		"	100 kΩ	RB 5100
R 23				22 kΩ	RB 4220
R 24			"	100 kΩ	RB 5100
R 25-27		"		22 kΩ	RB 4220
R 28				100 kΩ	RB 5100
R 29	Metal	"	1%	1,74 kΩ	RF 3174
R 30	Carbon	"	5%	100 kΩ	RB 5100
R 31,32	"		"	22 kΩ	RB 4220
R 33-35	"		"	100 kΩ	RB 5100
R 36	"	"	"	1,0 kΩ	RB 3100
R 37	"	"	"	2,2 kΩ	RB 3220

V 1	Op. Amp	TL064	VE 0151
V 2	"	TL081	VE 0142
V 3,4	3 × 2 Ch. Mult. Demult	CD4053	VD 2087
V 5	4 × 2 Input NOR	CD4001	VD 2000

8-pin Socket	JJ 0817
14-pin Socket	JJ 1416
16-pin Socket	JJ 1631
Printed Circuit Board	XC 1585

BRÜEL & KJÆR
Nærum - Denmark

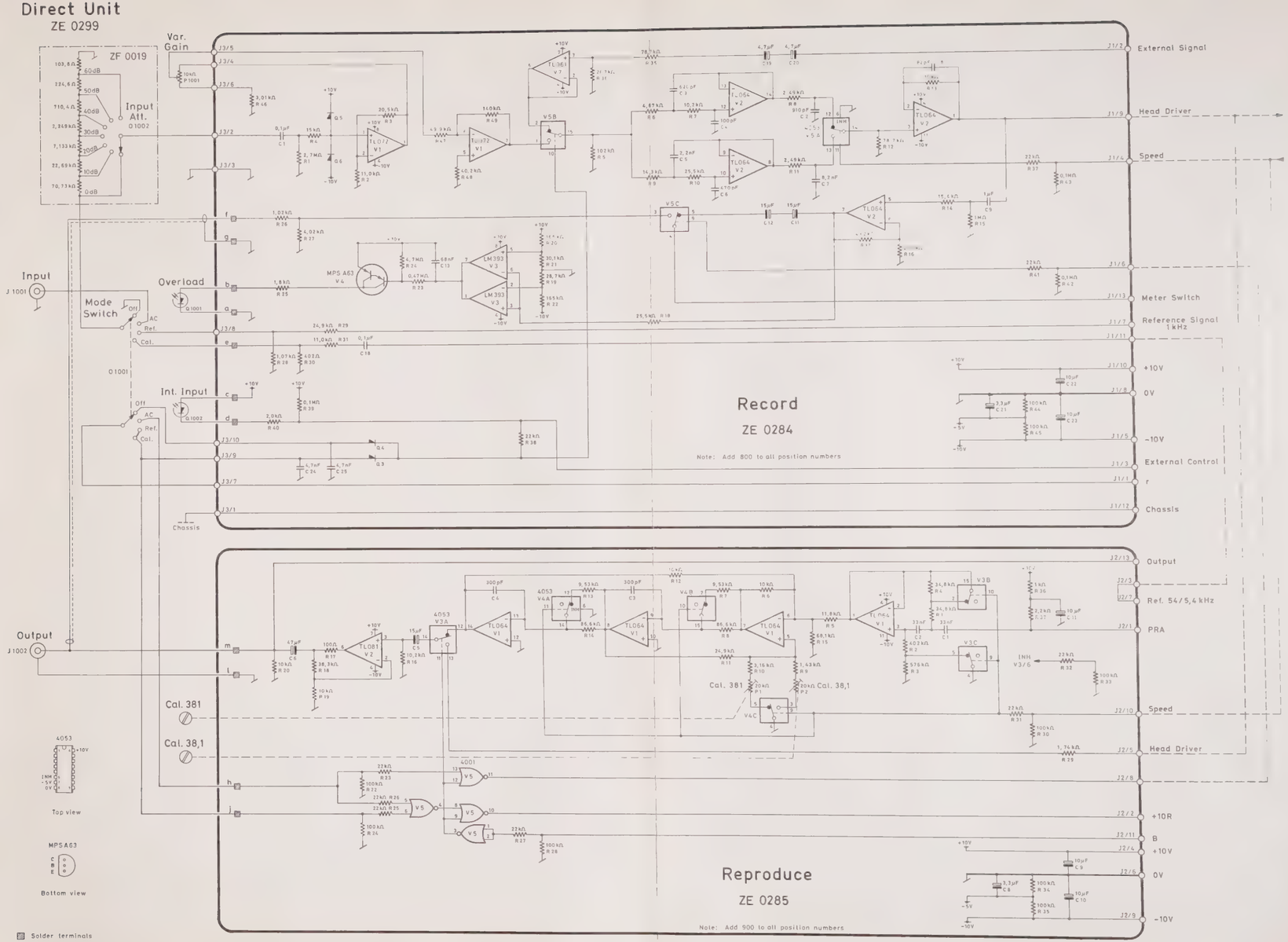
Direct Unit ZE 0299

CIRCUIT DIAGRAM

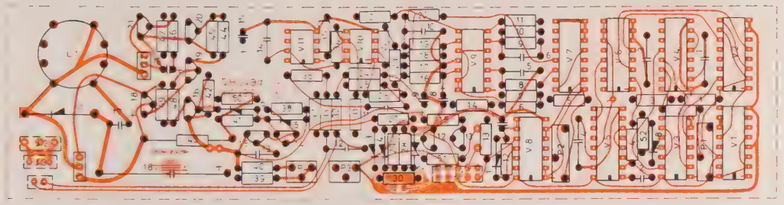
Add 1000 to all position numbers

J 1, 2	BNC Socket		JJ 0121
O 1	MODE SWITCH		OI 0033
O 2	INPUT ATT		ZF 0019
P 1	"Var. Gain"	10 kΩ	PG 3121
Q 1, 2	LED		QV 4002
	Knob		SN 0030
	· Cover		DD 0089
	· Indicator		SV 0046

Direct Unit
ZE 0299



803768 - 19790821 - (ZE 0284, ZE 0285 - ZE 0299 - 7005



Viewed from the component side

Note: Add 1400 to all position numbers

C 1	Polystyrene	2.4 nF 63 V	CT 1129	
C 2	Ceramic	2.2 nF 400 V	CK 3221	
C 3.4	Polystyrene	2.4 nF 63 V	CT 1129	
C 5	Polyester	15 nF 400 V	CS 0431	
C 6		10 nF 400 V	CS 0430	
C 7	Electrolytic	2.2 µF 63 V	CE 0541	
C 8	Tantalum	0.15 µF 35 V	CF 0050	
C 9	Electrolytic	2.2 µF 63 V	CE 0541	
C 10	Polyester	0.22 µF 63 V	CS 0438	
C 11		33 nF 250 V	CS 0433	
C 12		0.1 µF 100 V	CS 0436	
C 13		10 nF 400 V	CS 0430	
C 14		0.22 µF 63 V	CS 0438	
C 15	Electrolytic	1 µF 63 V	CE 0540	
C 16		10 µF/ 40 V	CE 0473	
C 17		47 µF/ 63 V	CE 0542	
C 18		470 µF/ 16 V	CE 0337	
L 1	Coil		LB 0944	
P 1	Cermet	10 kΩ	PG 3123	
P 2		20 kΩ	PG 3206	
P 3		100 kΩ	PG 4112	
P 4		1 kΩ	PG 2114	
Q 1	Si 1N4148	75 V 75 mA	QV 0216	
Q 2	Ze BZC79C5V1	4.8-5.4 V 0.25 W	QV 1339	
Q 3.6	Si 1N4148	75 V 75 mA	QV 0216	
Q 7	Si MR911	100 V 3 A	QV 0253	
Q 8	Si 1N4148	75 V 75 mA	QV 0216	

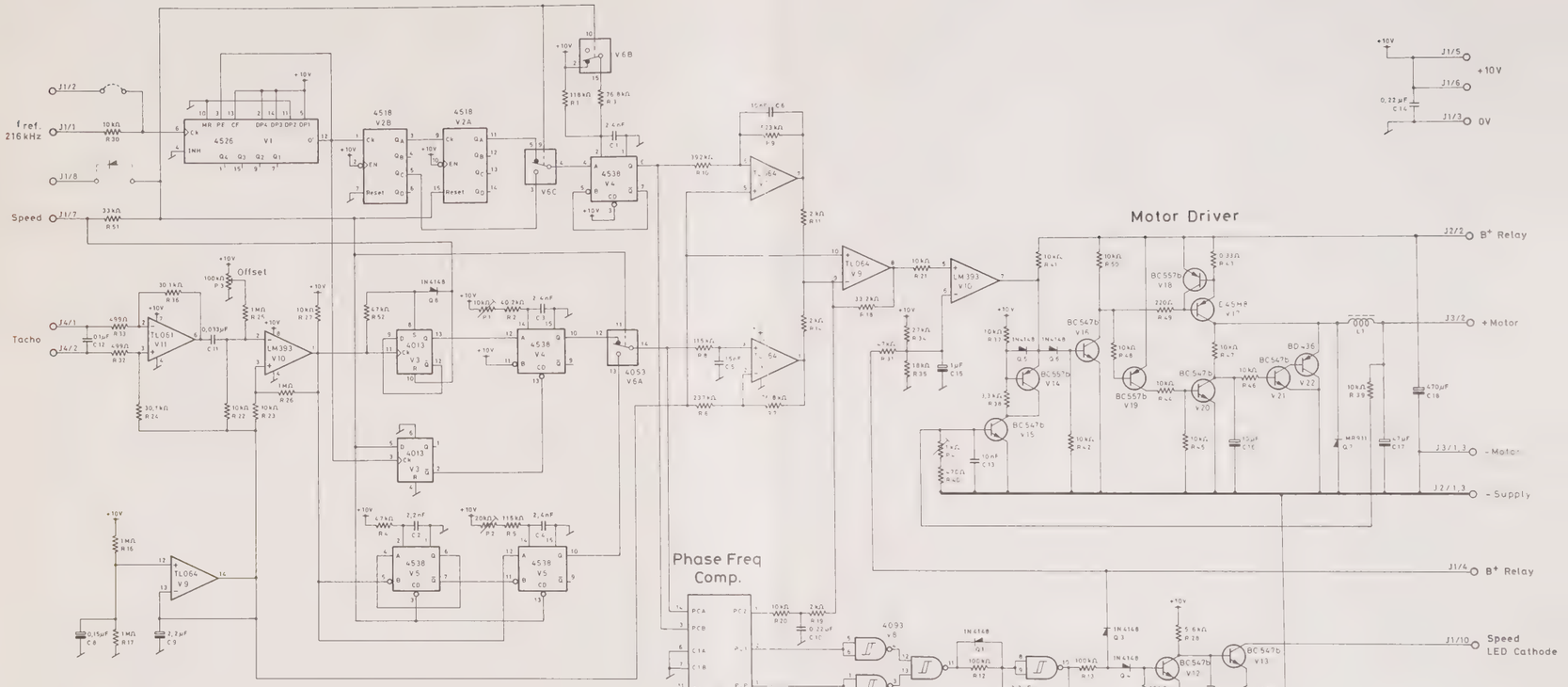
R 1	Metal	1/4 W	1%	118 kΩ	RF 5118
R 2				40.2 kΩ	RF 4402
R 3			-	76.8 kΩ	RF 4768
R 4	Carbon		5%	47 kΩ	RB 4470
R 5	Metal		1%	115 kΩ	RF 5115
R 6			-	237 kΩ	RF 5237
R 7	-		-	76.8 kΩ	RF 4768
R 8				115 kΩ	RF 5115
R 9				523 kΩ	RF 5523
R 10				392 kΩ	RF 5392
R 11			-	2.00 kΩ	RF 3200
R 12.13	Carbon		5%	100 kΩ	RB 5100
R 14	Metal		1%	2.00 kΩ	RF 3200
R 15	Carbon	1/4 W	5%	820 Ω	RB 2820
R 16.17	Metal	-	1%	1.00 MΩ	RF 6100
R 18				33.2 kΩ	RF 4332
R 19		-	-	2.00 kΩ	RF 3200
R 20.23	Carbon	-	5%	10 kΩ	RB 4100
R 24	Metal	-	1%	30.1 kΩ	RF 4301
R 25.26	Carbon	-	5%	1.0 MΩ	RB 6100
R 27				10 kΩ	RB 4100
R 28				5.6 kΩ	RB 3560
R 29.30				10 kΩ	RB 4100
R 31	-	-	-	47 kΩ	RB 4470
R 32.33	Metal	-	1%	499 Ω	RF 2499
R 34	Carbon	-	5%	27 kΩ	RB 4270
R 35	-	-	-	18 kΩ	RB 4180
R 36	Metal	-	1%	30.1 kΩ	RF 4301
R 37	Carbon	-	5%	10 kΩ	RB 4100
R 38				3.3 kΩ	RB 3330
R 39				10 kΩ	RB 4100
R 40				470 Ω	RB 2470
R 41.42	-	-	-	10 kΩ	RB 4100
R 43	Wire	4 W	10%	0.33 Ω	RO 1220
R 44.48	Carbon	1.4 W	5%	10 kΩ	RB 4100
R 49				220 Ω	RB 2220
R 50				10 kΩ	RB 4100
R 51				33 kΩ	RB 4330
R 52				47 kΩ	RB 4470

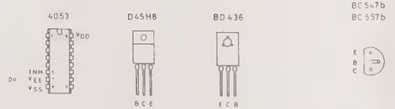
V 1	Programmable Down Counter	4526	VD 2115
V 2	2 × BCD Counter /Divider	4518B	VD 2036
V 3	2 × Set Reset D Flip-Flop	4013B	VD 2068
V 4.5	2 × Precision Monostable Mult	4538	VD 2097
V 6	3 × 2-Ch Multi- Demultiplex	4053B	VD 2087
V 7	Micropower Phase-Locked Loop	4046B	VD 2071
V 8	4 × 2 Inp NAND Schmitt Trig	4093B	VD 2081
V 9	Op Amp	TL064	VE 0151
V 10	Comparator	LM393N	VE 0163
V 11	Op Amp	TL061	VE 0135
V 12.13	Silicon NPN	BC 547 b	VB 0603
V 14	PNP	BC557b	VB 0135
V 15.16	NPN	BC547b	VB 0603
V 17	PNP	D 45 H 8	VB 0127
V 18.19	PNP	BC557b	VB 0135
V 20.21	NPN	BC547b	VB 0603
V 22	PNP	BD436	VB 0120

14-pin Socket	JJ 1416
16-pin Socket	JJ 1631
Printed Circuit Board	XC 1581

ZH 0194

Motor Servo Board ZH 0194

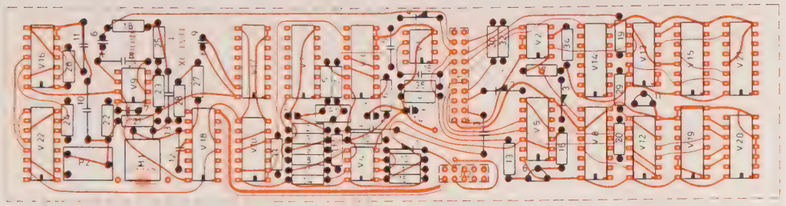




Note: Add 1400 to all position numbers

BRUEL & KJÆR
Nærum - Denmark

Reference Oscillator Board ZI 0046



C R S V

Viewed from the component side

Note Add 1600 to all position numbers

C 1	Electrolytic		10 µF / 40 V	CE 0473
C 2	-		33 µF 16 V	CE 0346
C 3	Polycarbonate		10 nF 400 V	CS 0129
C 4	Polystyrene	1%	1.2 nF 63 V	CT 1149
C 5	Polycarbonate		220 nF 63 V	CS 0438
C 6	Electrolytic		4.7 µF 40 V	CE 0475
C 7	Ceramic	5%	33 pF 400 V	CK 1330
C 8	Polystyrene	1%	270 pF 125 V	CT 1143
C 9	Electrolytic		10 µF / 40 V	CE 0473
C 10	Polystyrene	1%	15 nF 63 V	CT 1515
C 11	-	1%	10 nF 30 V	CT 1552
C 12	-	5%	33 pF 125 V	CT 0502
C 13	-	1%	270 pF 125 V	CT 1143
C 14	Electrolytic		10 µF / 40 V	CE 0473
C 15	Polycarbonate		220 nF 63 V	CS 0438
M 1	X-tal			MB 0020
P 1	Cermet		20 kΩ	PG 3209
P 2	-		50 kΩ	PG 3516
Q 1-4	Silicon	1N4148	75 V/75 mA	QV 0216
R 1	Carbon	1/4 W 5%	22 kΩ	RB 4220
R 2,3	-	- -	10 kΩ	RB 4100
R 4	-	- -	22 kΩ	RB 4220
R 5,6	-	- -	100 kΩ	RB 5100
R 7	-	- -	47 kΩ	RB 4470
R 8	-	- -	3.3 MΩ	RB 6330
R 9,10	-	- -	10 kΩ	RB 4100
R 11	-	- -	270 kΩ	RB 5270
R 12	-	- -	1.0 MΩ	RB 6100
R 13	-	- -	100 Ω	RB 2100
R 14	-	- -	47 kΩ	RB 4470
R 15	-	- -	22 kΩ	RB 4220
R 16	-	- -	100 kΩ	RB 5100
R 17	-	- -	10 kΩ	RB 4100
R 18	-	- -	100 kΩ	RB 5100
R 19	Carbon	1/4 W 5%	47 kΩ	RB 4470
R 20	-	- -	33 kΩ	RB 4330
R 21	Metal	- 1%	105 kΩ	RF 5105
R 22	-	- -	69.8 kΩ	RF 4698
R 23	Carbon	- 5%	47 kΩ	RB 4470
R 24	Metal	- 1%	196 kΩ	RF 5196
R 25	Carbon	- 5%	47 kΩ	RB 4470
R 26	Metal	- 1%	68.1 kΩ	RF 4681
R 27	Carbon	- 5%	20 MΩ	RH 0903
R 28	-	- -	1.0 kΩ	RB 3100
R 29	-	- -	33 kΩ	RB 4330
R 30	-	- -	22 kΩ	RB 4220
R 31	-	- -	10 kΩ	RB 4100
R 32	-	- -	22 kΩ	RB 4220
R 33	-	- -	10 kΩ	RB 4100
R 34, 35	-	- -	100 kΩ	RB 5100

V 1	Op. Amp.	TL081	VE 0142
V 2	2 × 2 Input NAND Driver	40107B	VD 2101
V 3	3 × 2 Ch. Miltipl./Demultipl.	4053	VD 2087
V 4	2 × Comparator	LM393N	VE 0163
V 5	4 × 2 Input NOR	4001	VD 2000
V 6	Silicon PNP	BC557b	VB 0135
V 7	Decade Counter/Divider	4017	VD 2009
V 8	12-Stage Bin./Ripple Counter	4040	VD 2021
V 9	Op. Amp.	LM308	VE 0046
V 10	4 × 2 Input NAND	4011	VD 2004
V 11	Silicon NPN	BC547b	VB 0603
V 12, 13	4 × 2 Input NAND	4011	VD 2004
V 14, 15	Decade Counter/Divider	4017	VD 2009
V 16	2 × Set/Reset D Flip-Flop	4013B	VD 2068
V 17	2 × BCD Counter/Divider	4518	VD 2036
V 18	14 Stage Counter/Div. and osc.	4060	VD 2064
V 19	4-bit Up/Down Bin. Counter	40193B	VD 2050
V 20	2 × 4 Input NOR	4002	VD 2001
V 21	Decade Counter/Divider	4017	VD 2009
V 22	Indstr. Time Base Gen.	4566B	VD 2085

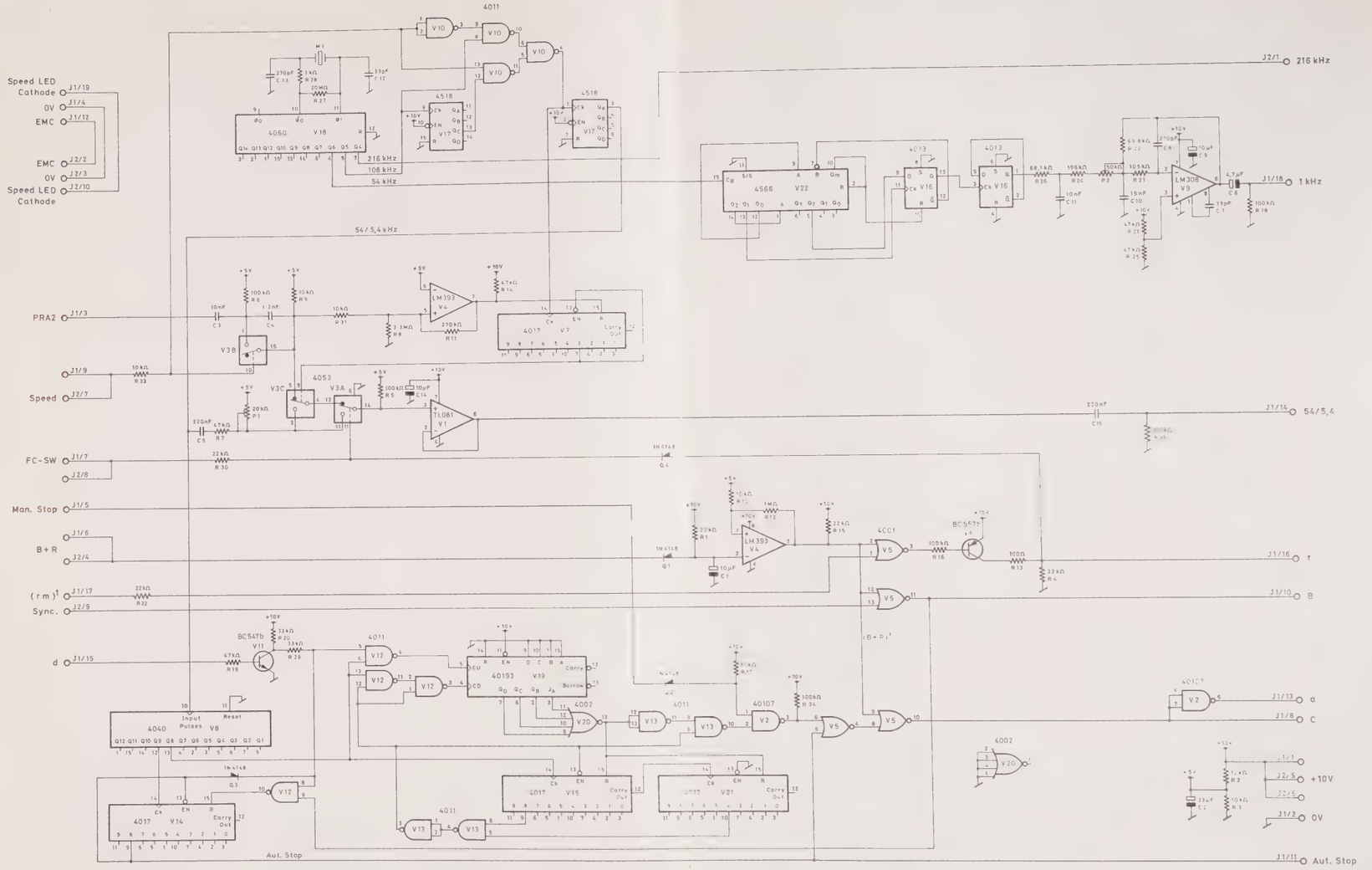
	8-pin Socket	JJ 0817
	16-pin Socket	JJ 1631
	Printed Circuit Board	XC 1731

ZI 0046

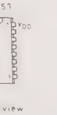
Valid from serial no. 903768

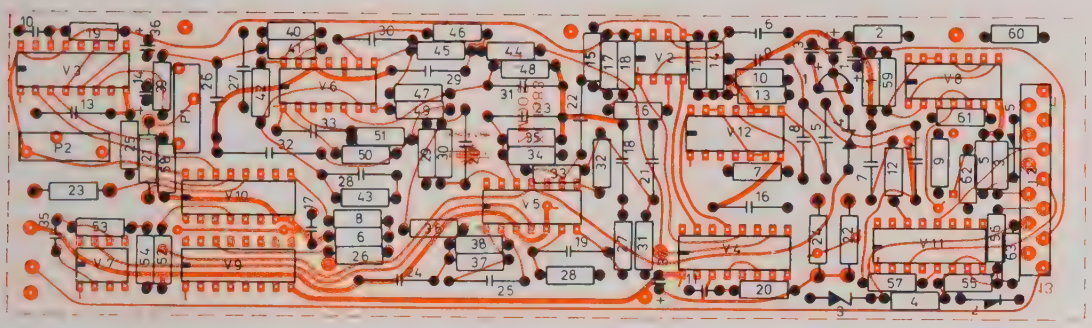
9.81

Reference Oscillator Board ZI 0046



Note: Add 1600 to all position numbers.





C Q Q R V

Viewed from the component side

Note: Add 1700 to all position numbers

C 1	Tantalum		10 µF 16 V	CF 0059	
C 2			2,2 µF 20 V	CF 0022	
C 3			10 µF 16 V	CF 0059	
C 4	Polystyrene	1%	68 pF 630 V	CT 1191	
C 5	-	1%	620 pF 125 V	CT 1109	
C 6	Polyester		22 nF 400 V	CS 0432	
C 7	Polystyrene	1%	68 pF 630 V	CT 1191	
C 8	-	1%	620 pF 125 V	CT 1109	
C 9	Polyester		22 nF 400 V	CS 0432	
C 10,11	Ceramic		100 pF 400 V	CK 2103	
C 13	Polystyrene	1%	330 pF 125 V	CT 1144	
C 14	Tantalum		1 µF 35 V	CF 0062	
C 16	Polystyrene	1%	330 pF 125 V	CT 1144	
C 17	Ceramic	5%	22 pF 400 V	CK 1220	
C 18	Polystyrene	1%	1 nF 63 V	CT 1132	
C 19	-	1%	330 pF/125 V	CT 1144	
C 20	-	1%	470 pF 125 V	CT 1111	
C 21	-	1%	1 nF 63 V	CT 1132	
C 22	-	1%	82 pF 160 V	CT 1162	
C 23	-	1%	470 pF 125 V	CT 1111	
C 24	-	1%	1,1 nF 30 V	CT 1148	
C 25	-	1%	200 pF 125 V	CT 1118	
C 26	-	1%	10 nF 30 V	CT 1552	
C 27	-	1%	820 pF 63 V	CT 1121	
C 28	-	1%	4,7 nF 30 V	CT 1566	
C 29	-	1%	10 nF 30 V	CT 1552	
C 30	-	1%	820 pF 63 V	CT 1121	
C 31	-	1%	4,7 nF 30 V	CT 1566	
C 32	-	1%	11 nF 63 V	CT 1551	
C 33	-	1%	2 nF 63 V	CT 1123	
C 35	Ceramic		100 pF 400 V	CK 2103	
C 36 37	Tantalum		2,2 µF 20 V	CF 0022	

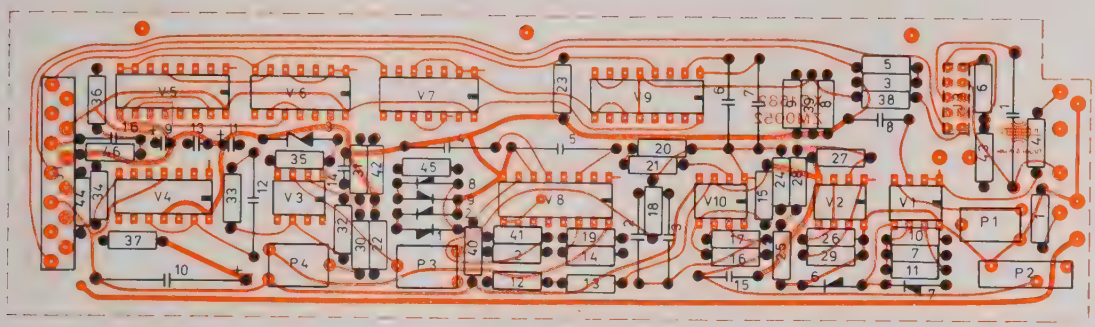
R 1-8	Carbon	1/4 W	5%	47 kΩ	RB 4470
R 9-12	Metal	-	1%	10,0 kΩ	RF 4100
R 13	-	-	-	100 kΩ	RF 5100
R 14	-	-	-	10,0 kΩ	RF 4100
R 15,16	Carbon	-	5%	470 kΩ	RB 5470
R 17,18	-	-	-	10 kΩ	RB 4100
R 19,20	-	-	-	18 kΩ	RB 4180
R 21 22	Metal	-	1%	13,3 kΩ	RF 4133
R 23 24	-	-	-	133 kΩ	RF 5133
R 25	-	-	-	10,0 kΩ	RF 4100
R 26 27			-	44,2 kΩ	RF 4442
R 28	-	-		22,1 kΩ	RF 4221
R 29 30			-	26,7 kΩ	RF 4267
R 31 32				44,2 kΩ	RF 4442
R 33	-			22,1 kΩ	RF 4221
R 34 37	-	-	-	26,7 kΩ	RF 4267
R 38				13,3 kΩ	RF 4133
R 39 40	-			44,2 kΩ	RF 4442
R 41		-	-	22,1 kΩ	RF 4221
R 42,43				26,7 kΩ	RF 4267
R 44 45				44,2 kΩ	RF 4442
R 46				22,1 kΩ	RF 4221
R 47 50	-			26,7 kΩ	RF 4267
R 51	-			13,3 kΩ	RF 4133
R 52	Carbon	-	5%	47 kΩ	RB 4470
R 53				100 Ω	RB 2100
R 54				10 kΩ	RB 4100
R 55,56	-			100 kΩ	RB 5100
R 57				2,2 kΩ	RB 3220
R 58	-			47 kΩ	RB 4470
R 59 63				10 kΩ	RB 4100

J 2	13-pin Plug			JP 1301
P 1 2	Cermet		500 Ω	PG 1511
Q 2	Si	1N4148	75 V/75 mA	QV 0216
Q 3	Ze	BXC79C5V6	5,3-5,9 V/0,25 W	QV 1105
Q 4	-	BXC79B6V2	6,1-6,3 V/0,25 W	QV 1372
Q 5	Si	1N4148	75 V/75 mA	QV 0216

V 1	Fixed Voltage Regulator	78L08	VE 0173
V 2	Comparator	LM393	VE 0163
V 3 4	2 × Monostable Multivibr	4528	VD 2032
V 5 6	Op Amp	TL064	VE 0151
V 7	Op Amp	TL081	VE 0142
V 8	4 × 2 Inp NOR	4001	VD 2000
V 9	Decade Counter/Div w. Dec	4017	VD 2009
V 10 11	3 × 2-ch Multi Demultiplex	4053	VD 2087
V 12	4 × Bilateral Switch	4066	VD 2008

8-pin Socket	JJ 0817
14-pin Socket	JJ 1416
16-pin Socket	JJ 1631
Printed Circuit Board	XC 1583

ZM 0051



Viewed from the component side

Note. Add 1800 to all position numbers

C 1	Polycarbonate		1 µF/ 63 V	CS 0804
C 2	Polystyrene	1%	100 pF/125 V	CT 1133
C 3	"	1%	1 nF/ 63 V	CT 1132
C 4	"	1%	2,7 nF/ 63 V	CT 1158
C 5	"	1%	27 nF/ 63 V	CT 1518
C 6	"	1%	110 pF/630 V	CT 1136
C 7			1,1 nF/ 30 V	CT 1148
C 8	Polyester		47 nF/250 V	CS 0434
C 9	Tantalum		22 µF/ 16 V	CF 0031
C 10	Electrolytic		100 µF/ 16 V	CE 0310
C 11	Tantalum		15 µF/ 10 V	CF 0016
C 12	Glass		1 nF/300 V	CG 0001
C 13	Ceramic		220 pF/ 63 V	CK 2221
C 14			100 pF/400 V	CK 2103
C 15	Polyester		47 nF/250 V	CS 0434
C 16	"		100 nF/100 V	CS 0436
J 1	13-pin Socket			JP 1301
P 1	Cermet		50 kΩ	PG 3516
P 2			50 kΩ	PG 3513
P 3			5 kΩ	PG 2521
P 4			1 MΩ	PG 5112

Q 1 2	Si.	BA314	0,68-0,76 V/0,25 W	QV 1385
Q 3	Ze.	1N4567	5,53-6,66 V/0,40 W	QV 0048
Q 6 7	Si.	FDH300	150 V/200 mA	QV 0242
Q 8 9	"	BA314	0,68 -0,76 V/0,25 W	QV 1385

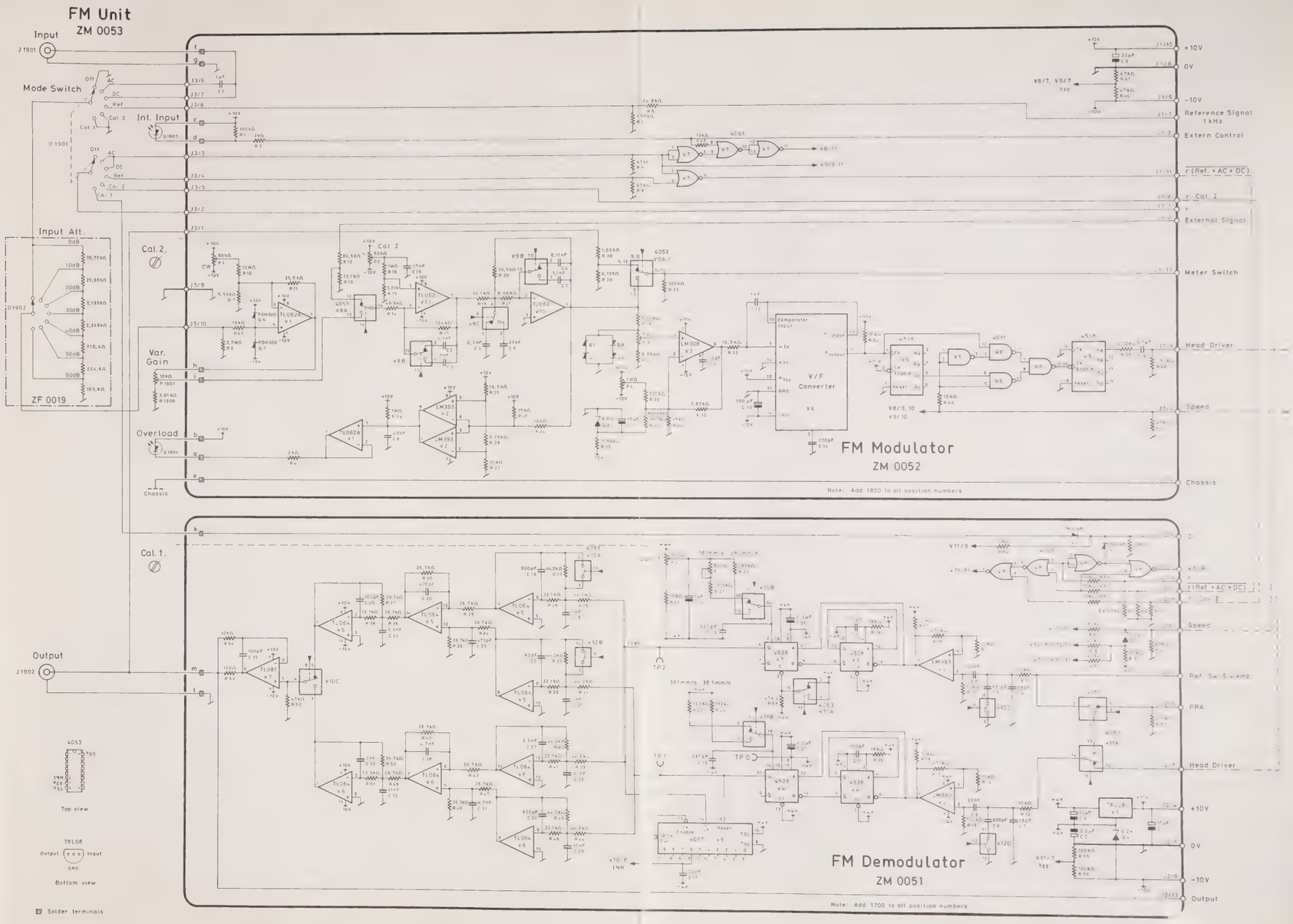
R 1	Carbon	1/4 W	5%	100 kΩ	RB 5100
R 2	Metal		1%	2,00 kΩ	RF 3200
R 3				1,07 kΩ	RF 3107
R 4				2,00 kΩ	RF 3200
R 5				24,9 kΩ	RF 4249
R 6	Carbon		5%	2,7 MΩ	RB 6270
R 7	Metal		1%	9,53 kΩ	RF 3953
R 8 9	Carbon		5%	47 kΩ	RB 4470
R 10				10 MΩ	RB 7100
R 11	Metal		1%	21,5 kΩ	RF 4215
R 12				84,5 kΩ	RF 4845
R 13				12,1 kΩ	RF 4121
R 14				49,9 kΩ	RF 4499
R 15	"			1,21 kΩ	RF 3121
R 16	Carbon	1/4 W	5%	1,0 MΩ	RB 6100
R 17	Metal	-	1%	124 kΩ	RF 5124
R 18		-	-	5,23 kΩ	RF 3523
R 19		-	-	12,1 kΩ	RF 4121
R 20		-	-	36,5 kΩ	RF 4365
R 21	"	-	-	8,66 kΩ	RF 3866
R 22		-	-	8,25 kΩ	RF 3825
R 23	Carbon	-	5%	100 kΩ	RB 5100
R 24	Metal		1%	10,0 kΩ	RF 4100
R 25	"	-	-	16,5 kΩ	RF 4165
R 26	"	-	-	15,0 kΩ	RF 4150
R 27		-	-	10,0 kΩ	RF 4100
R 28		-	-	6,19 kΩ	RF 3619
R 29	Carbon	-	5%	1,0 MΩ	RB 6100
R 30	"	-	-	330 kΩ	RB 5330
R 31	Metal	-	1%	14,0 kΩ	RF 4140
R 32	"			7,87 kΩ	RF 3787
R 33	"	-	-	16,5 kΩ	RF 4165
R 34	Carbon	-	5%	10 kΩ	RB 4100
R 35	Metal	-	1%	3,92 kΩ	RF 3392
R 36	"	-	-	4,02 kΩ	RF 3402
R 37	Carbon	-	5%	47 kΩ	RB 4470
R 38	Metal	-	1%	1,02 kΩ	RF 3102
R 39	"	-	-	4,12 kΩ	RF 3412
R 40,41	Carbon	-	5%	47 kΩ	RB 4470
R 42	Mertal	-	1%	15,0 kΩ	RF 4150
R 43	Carbon	-	5%	15 kΩ	RB 4150
R 44,45		-		10 kΩ	RB 4100
R 46	Metal	-	1%	1,50 kΩ	RF 3150

V 1	Op. Amp.	TL062A	VE 0212
V 2	Comparator	LM393	VE 0163
V 3	Op. Amp	LM308	VE 0046
V 4	V/F Converter	VFC32	VE 0164
V 5	2 × BCD Counter/Divider	4518	VD 2036
V 6	4 × 2 Input NAND	4011	VD 2004
V 7	4 × 2 Input NOR	4001	VD 2000
V 8 9	3 × 2 Ch Mult /Demult	4053	VD 2087
V 10	Op Amp	TL062	VE 0136

8-pin Socket	JJ 0817
14-pin Socket	JJ 1416
16-pin Socket	JJ 1631
Printed Circuit Board	XC 1582

ZM 0052

J 1901 2	BNC Socket	JJ 0121
O 1901	MODE SWITCH	QI 0034
O 1902	INPUT ATT	ZF 0019
P 1901	VAR GAIN	PG 3121
Q 1804 5	LED	QV 4002
R 1908	Metal	RF 3301
	Knob	SN 0030
	- Cover	
	- Indicator	



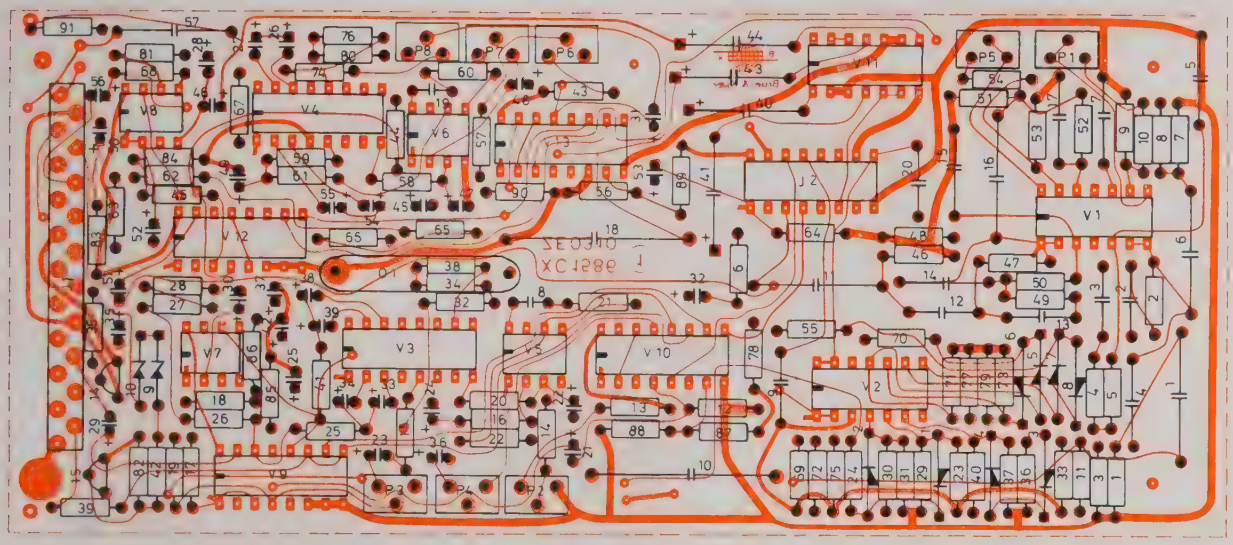
903768 - 197901 921 - ZM 0053 - 7005

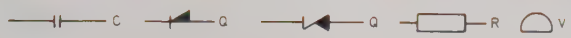
Two Channel Compander Unit

ZM 0054

ZE 0310

LAYOUT DIAGRAM/PARTS LIST





Viewed from the component side

Note. Add 1100 to all position numbers

C 1	Polystyrene	1%	20 nF/ 63 V	CT 1125
C 2,3	Polycarbonate		100 nF/100 V	CS 0436
C 4,5	Polystyrene	1%	1 nF/ 63 V	CT 1132
C 6		1%	9,1 nF/ 63 V	CT 1513
C 7	"	1%	68 pF/630 V	CT 1191
C 8	Ceramic	5%	33 pF/400 V	CK 1330
C 9	Polycarbonate		68 nF/100 V	CS 0392
C 10	"	2%	2,2 µF/ 63 V	CS 0054
C 11	Polystyrene	1%	20 nF/ 63 V	CT 1125
C 12,13	Polycarbonate		100 nF/100 V	CS 0436
C 14,15	Polystyrene	1%	1 nF/ 63 V	CT 1132
C 16		1%	9,1 nF/ 63 V	CT 1513
C 17	"	1%	68 pF/630 V	CT 1191
C 18	Polycarbonate	2%	2,2 µF/ 63 V	CS 0054
C 19	Ceramic	5%	33 pF/400 V	CK 1330
C 20	Polycarbonate		68 nF/100 V	CS 0392
C 21	Electrolytic		4,7 µF/ 40 V	CE 0475
C 22	"		10 µF/ 40 V	CE 0473
C 23			4,7 µF/ 40 V	CE 0475
C 24			22 µF/ 16 V	CE 0352
C 25 26			4,7 µF/ 40 V	CE 0475
C 27			10 µF/ 40 V	CE 0473
C 28 29			22 µF/ 10 V	CE 0352
C 30			2,2 µF/ 63 V	CE 0541
C 31			4,7 µF/ 40 V	CE 0475
C 32			1 µF/ 63 V	CE 0540
C 33			4,7 µF/ 40 V	CE 0475
C 34			10 µF/ 40 V	CE 0473
C 35			2,2 µF/ 63 V	CE 0541
C 36	"		4,7 µF/ 40 V	CE 0475
C 37			22 µF/ 10 V	CE 0352
C 38			4,7 µF/ 40 V	CE 0475
C 39			10 µF/ 40 V	CE 0473
C 40,41	Tantalum		22 µF/ 15 V	CF 0042
C 42	Electrolytic		2,2 µF/ 63 V	CE 0541
C 43,44	Tantalum		22 µF/ 15 V	CF 0042
C 45	Electrolytic		4,7 µF/ 40 V	CE 0475
C 46	"		2,2 µF/ 63 V	CE 0541
C 47	"		10 µF/ 40 V	CE 0473
C 48	"		4,7 µF/ 40 V	CE 0475
C 49	"		22 µF/ 10 V	CE 0352
C 50			4,7 µF/ 40 V	CE 0475
C 51	"		22 µF/ 10 V	CE 0352
C 52	"		2,2 µF/ 63 V	CE 0541
C 53	"		1 µF/ 63 V	CE 0540
C 54	"		4,7 µF/ 40 V	CE 0475
C 55	"		10 µF/ 40 V	CE 0473
C 56	"		2,2 µF/ 63 V	CE 0541
C 57	Polyester		0,1 µF/250 V	CS 0013
J 1	21-pin Plug			JP 2101
J 2	16-pin Socket			JJ 1622
O 1	Switch			OE 0184
P 1	Cermet		5 kΩ	PG 2520
P 2			20 kΩ	PG 3209
P 3 4	"		10 kΩ	PG 3121
P 5	"		5 kΩ	PG 2520
P 6			20 kΩ	PG 3209
P 7 8			10 kΩ	PG 3121
Q 1-8	Ge.	AA119	45 V/100 mA	QV 0079
Q 9	Ze	ZPD12	11,4-12,7 V/0,4 W	QV 1368
Q 10	-	BZY88C5	4,8-5,3 V/0,25 W	QV 1339

continued

ZM 0054 Two Channel Compander Unit

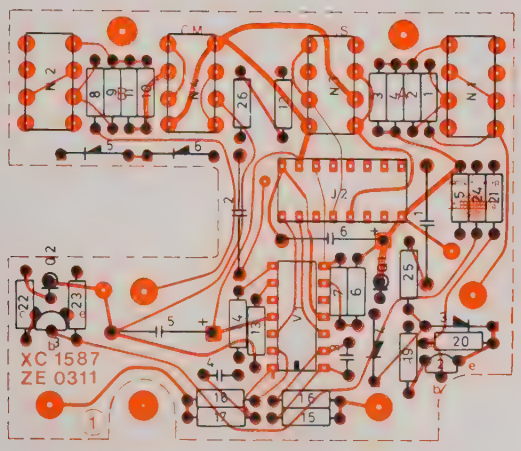
ZE 0310

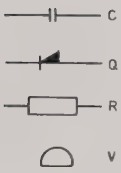
PARTS LIST

R 1	Metal	1/4 W	1%	11.3 kΩ	RF 4113
R 2,3	"	"	"	76.8 kΩ	RF 4768
R 4,5				13.0 kΩ	RF 4130
R 6	Carbon	"	5%	100 kΩ	RB 5100
R 7	Metal		1%	169 kΩ	RF 5169
R 8	"	"	"	100 kΩ	RF 5100
R 9		"		22.1 kΩ	RF 4221
R 10	"	"		6.81 kΩ	RF 3681
R 11	"	"	"	46.4 kΩ	RF 4464
R 12	Carbon	"	5%	100 kΩ	RB 5100
R 13		"		68 kΩ	RB 4680
R 14			"	100 kΩ	RB 5100
R 15	Metal	"	1%	26.1 kΩ	RF 4261
R 16	"	"	"	26.7 kΩ	RF 4267
R 17	Carbon	"	5%	100 kΩ	RB 5100
R 18	Metal		1%	107 kΩ	RF 5107
R 19	"	"		30.9 kΩ	RF 4309
R 20	"	"		1.00 kΩ	RF 3100
R 21			"	2.00 kΩ	RF 3200
R 22				26.7 kΩ	RF 4267
R 23	"	"	"	249 kΩ	RF 5249
R 24	"	"	"	17.8 kΩ	RF 4178
R 25	"	"		2.80 kΩ	RF 3280
R 26,27	Carbon	"	5%	100 kΩ	RB 5100
R 28	"	"	"	10 kΩ	RB 4100
R 29	Metal		1%	10.0 kΩ	RF 4100
R 30	"	"	"	249 kΩ	RF 5249
R 31				10.0 kΩ	RF 4100
R 32		"	"	26.1 kΩ	RF 4261
R 33			"	249 kΩ	RF 5249
R 34	"		"	26.7 kΩ	RF 4267
R 35	Carbon	"	5%	10 kΩ	RB 4100
R 36,37	Metal	"	1%	10.0 kΩ	RF 4100
R 38		"	"	26.7 kΩ	RF 4267
R 39	Carbon	"	5%	100 kΩ	RB 5100
R 40	Metal	"	1%	249 kΩ	RF 5249
R 41				2.80 kΩ	RF 3280
R 42	Carbon		5%	4.7 kΩ	RB 3470
R 43	"		"	68 kΩ	RB 4680
R 44	Metal	"	1%	26.1 kΩ	RF 4261
R 45	Carbon	"	5%	100 kΩ	RB 5100
R 46	Metal	"	1%	11.3 kΩ	RF 4113
R 47,48		"		76.8 kΩ	RF 4768
R 49,50		"		13.0 kΩ	RF 4130
R 51		"	"	169 kΩ	RF 5169
R 52		"		100 kΩ	RF 5100
R 53		"	"	22.1 kΩ	RF 4221
R 54			"	6.81 kΩ	RF 3681
R 55		"		46.4 kΩ	RF 4464
R 56,57	Carbon		5%	100 kΩ	RB 5100
R 58	Metal		1%	1.00 kΩ	RF 3100
R 59			"	26.7 kΩ	RF 4267
R 60				2.00 kΩ	RF 3200
R 61	"		"	26.7 kΩ	RF 4267
R 62				107 kΩ	RF 5107
R 63	"		"	30.9 kΩ	RF 4309
R 64,65	Carbon		5%	100 kΩ	RB 5100
R 66	Metal		1%	2.80 kΩ	RF 3280
R 67	Carbon		5%	100 kΩ	RB 5100
R 68				10 kΩ	RB 4100
R 69	Metal	1/4 W	1%	249 kΩ	RF 5249
R 70	"	"	"	17.8 kΩ	RF 4178
R 71	"	"	"	10.0 kΩ	RF 4100
R 72				249 kΩ	RF 5249
R 73				10.0 kΩ	RF 4100
R 74			"	26.1 kΩ	RF 4261
R 75				249 kΩ	RF 5249
R 76		"		26.7 kΩ	RF 4267
R 77		"		10.0 kΩ	RF 4100
R 78		"		249 kΩ	RF 5249
R 79		"	"	10.0 kΩ	RF 4100
R 80		"		26.7 kΩ	RF 4267
R 81		"		2.80 kΩ	RF 3280
R 82	Carbon	"	5%	10 kΩ	RB 4100
R 83-90	"		"	100 kΩ	RB 5100
R 91	"	"	"	1.0 MΩ	RB 6100

V 1	Op Amp	TL074	VE 0158
V 2	Comparator	LM339	VE 0110
V 3 4	Compandor	NE570	VE 0165
V 5 6	Op Amp	NE 1034	VE 0127
V 7 8	" "	TL062	VE 0136
V 9 10	3 × 2 Ch Mult /Demult	4053	VD 2087
V 11	4 × Bilateral Switch	4066	VD 2008
V 12 13	3 × 2 Ch Mult /Demult	4053	VD 2087
V 14 15	Silicon NPN	BC547b	VB 0603

8-pin Socket	JJ 0817
14-pin Socket	JJ 1416
16-pin Socket	JJ 1631
Printed Circuit Board	XC 1586





Viewed from the printed circuit side

Note. Add 1200 to all position numbers

C 1,2	Polyester	22 nF/400 V	CS 0432	R 19	Metal	1/4 W	1%	2,00 kΩ	RF 3200
C 3, 4	Ceramic	100 pF/400 V	CK 2103	R 20	Carbon	-	10%	4,7 MΩ	RB 6470
C 5,6	Electrolytic	10 µF/ 25 V	CE 0416	R 21	-	-	5%	470 kΩ	RB 5470
				R 22	Metal	-	1%	2,00 kΩ	RF 3200
				R 23	Carbon	-	5%	4,7 MΩ	RB 6470
J 2	16-pin Plug		JP	R 24	-	-	-	470 kΩ	RB 5470
				R 25,26	Metal	-	1%	15,0 kΩ	RF 4150
N 1	INPUT ATT.		NN 0042						
N 2	INPUT ATT		NN 0042	V 1	Op. Amp.			TL074	VE 0158
N 3	INPUT SWITCH		NN 0042	V 2,3	Silicon	PNP		MPSA63	VB 0133
N 4	COMPANDER MODE		NN 0042						
					14-pin Socket				JJ 1408
Q 1,2	LED		QV 4002						
Q 3-6	Si. FDH300	150 V/200 mA	QV 0242		Printed Circuit Board				XC 1587

R 1	Metal	1/4 W	1%	90,9 kΩ	RF 4909
R 2				9,09 kΩ	RF 3909
R 3				102 kΩ	RF 5102
R 4				1,02 kΩ	RF 3102
R 5	Carbon		10%	10 MΩ	RB 7100
R 6	Metal		1%	3,09 kΩ	RF 3309
R 7				28,0 kΩ	RF 4280
R 8				90,9 kΩ	RF 4909
R 9				9,09 kΩ	RF 3909
R 10				102 kΩ	RF 5102
R 11				1,02 kΩ	RF 3102
R 12	Carbon		10%	10 MΩ	RB 7100
R 13	Metal		1%	3,09 kΩ	RF 3309
R 14				28,0 kΩ	RF 4280
R 15	Carbon		5%	100 Ω	RB 2100
R 16				10 kΩ	RB 4100
R 17				100 Ω	RB 2100
R 18				10 kΩ	RB 4100

ZE 0311

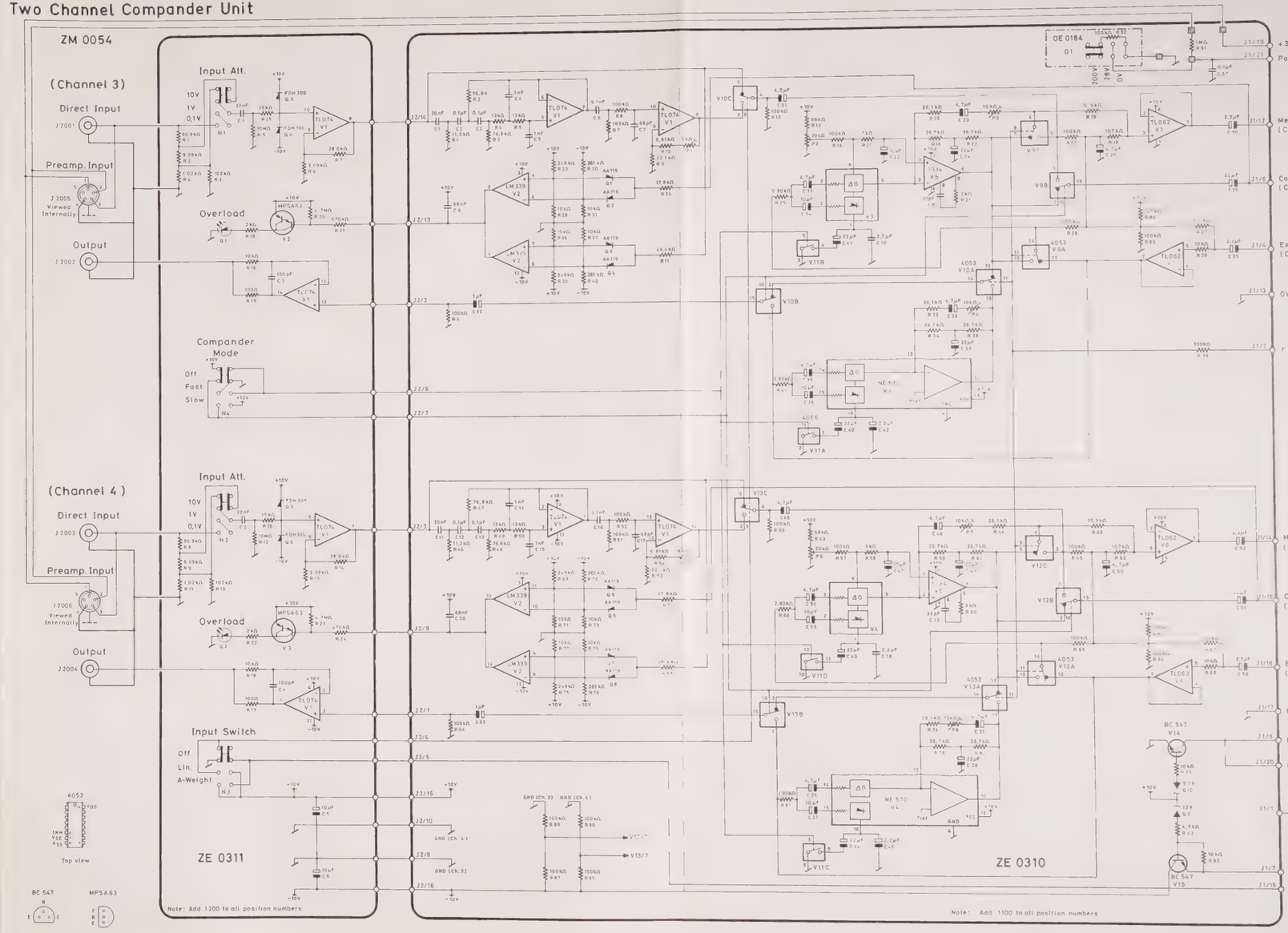
Note Add 2000 to all position numbers

J 1	"Direct Input"	JJ 0121
J 2	"Output"	JJ 0121
J 3	"Direct Input"	JJ 0121
J 4	"Output"	JJ 0121
J 5	"Preamp Input"	JJ 0507
J 6	"Preamp Input"	JJ 0507

OE 0184

O 1	POL VOLT				NN 0101
R 92	Metal	1/4 W	1%	110 kΩ	RF 5110

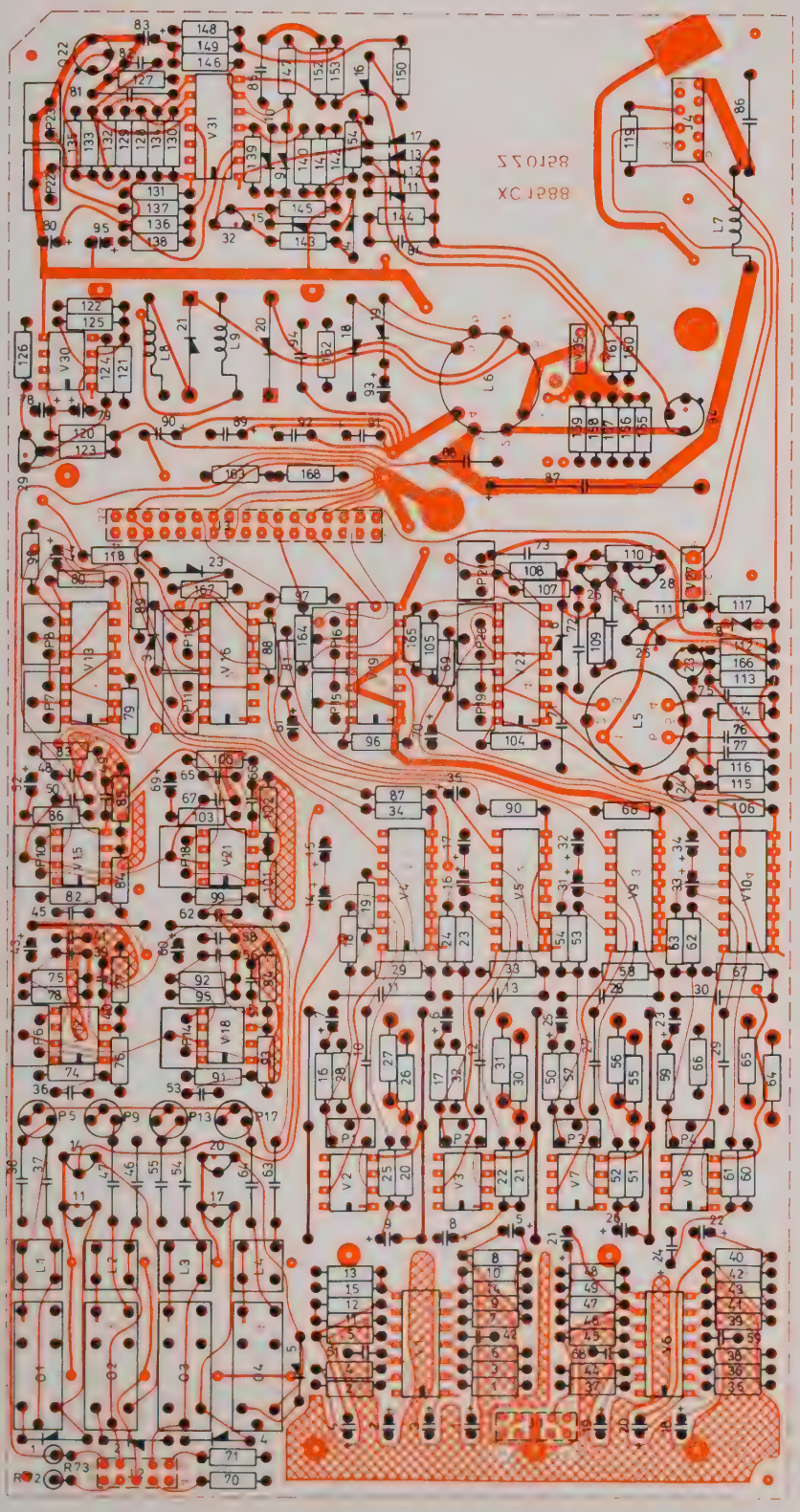
Two Channel Compander Unit



903768-19790821 - (ZE 0310 ZE 0311) - ZM 0054 - 7005

Main Board

LAYOUT DIAGRAM



Viewed from the component side

ZZ 0158

PARTS LIST

Note. Add 2100 to all position numbers

C 1,2	Electrolytic		10 µF/ 40 V	CE 0473
C 3-9	-		33 µF/ 10 V	CE 0346
C 10-13	Polystyrene		5,6 nF/ 63 V	CT 1509
C 14-17	Electrolytic		33 µF/ 10 V	CE 0346
C 18,19	-		10 µF/ 40 V	CE 0473
C 20-23	-		33 µF/ 10 V	CE 0346
C 24	-		33 µF/ 10 V	CE 0353
C 25, 26	-		33 µF/ 10 V	CE 0346
C 27-30	Polystyrene		5,6 nF/ 63 V	CT 1509
C 31-34	Electrolytic		33 µF/ 10 V	CE 0346
C 35	-		22 µF/ 25 V	CE 0352
C 36	Ceramic		220 pF/400 V	CK 2222
C 37	Polystyrene		820 pF/ 63 V	CT 1121
C 38	-		2,2 nF/ 63 V	CT 1126
C 39	Ceramic		2,7 pF/400 V	CK 0270
C 40,41	-		10 nF/ 30 V	CK 4101
C 42	-		120 pF/400 V	CK 2122
C 43	Electrolytic		15 µF/ 25 V	CE 0474
C 44	-		22 µF/ 25 V	CE 0352
C 45	Ceramic		220 pF/400 V	CK 2222
C 46	Polystyrene		820 pF/ 63 V	CT 1121
C 47	-		2,2 nF/ 63 V	CT 1126
C 48	Ceramic		2,7 pF/400 V	CK 0270
C 49,50		1%	10 nF/ 30 V	CK 4101
C 51	-	1%	120 pF/400 V	CK 2122
C 52	Electrolytic		15 µF/ 25 V	CE 0474
C 53	Ceramic		220 pF/400 V	CK 2222
C 54	Polystyrene		820 pF/ 63 V	CT 1121
C 55			2,2 nF/ 63 V	CT 1126
C 56	Ceramic		2,7 pF/400 V	CK 0270
C 57,58	-	1%	10 nF/ 30 V	CK 4101
C 59	-	1%	120 pF/400 V	CK 2122
C 60	Electrolytic		15 µF/ 25 V	CE 0474
C 61	-		22 µF/ 25 V	CE 0352
C 62	Ceramic		220 pF/400 V	CK 2222
C 63	Polystyrene		820 pF/ 63 V	CT 1121
C 64	-		2,2 nF/ 63 V	CT 1126
C 65	Ceramic	1%	2,7 pF/400 V	CK 0270
C 66,67		1%	10 nF/ 30 V	CK 4101
C 68	-		120 pF/400 V	CK 2122
C 69	Electrolytic		15 µF/ 25 V	CE 0474
C 70			22 µF/ 25 V	CE 0352
C 71	Polystyrene	1%	6,8 nF/ 63 V	CT 1511
C 72		1%	3,3 nF/ 30 V	CT 1544
C 73	-	1%	2,4 nF/ 63 V	CT 1129
C 74	-	1%	1 nF/ 63 V	CT 1132
C 75-77	-	1%	820 pF/ 63 V	CT 1121
C 78	Electrolytic		15 µF 25 V	CE 0474
C 79	Tantalum		10 µF 35 V	CF 0064
C 80	Electrolytic	1%	15 µF/ 25 V	CE 0474
C 81	Polystyrene	1%	1,6 nF/ 63 V	CT 1181
C 82	Ceramic		33 pF/400 V	CK 1330
C 83	Electrolytic		6,8 µF/ 25 V	CE 0472
C 84	Polyester		22 nF 400 V	CS 0432
C 85			10 nF 400 V	CS 0430
C 86	Electrolytic		10 µF 63 V	CE 0529
C 87			220 µF/ 40 V	CE 0464
C 88	Ceramic		47 nF 30 V	CK 4470
C 89-92	Tantalum		100 µF/ 16 V	CF 0078
C 93	Electrolytic		10 µF 40 V	CE 0473
C 94	Polyester		68 nF 250 V	CS 0435
C 95	Electrolytic		15 µF 25 V	CE 0474
J 4	9-pin Connector			JP 0907
L 1-4	Coil		0,5 mH	LB 0890
L 5	Coil			LB0942
L 6	Transformer			LB0943
L 7	Choke			LJ 0031
L 8,9	Filter Coil			LB 0955
O 1-4	Relay			OC 0058
P 1-4	Cermet		1 kΩ	PG 2114
P 5	-		500 Ω	PG 1507
P 6	-		20 kΩ	PG 3209
P 7			2 kΩ	PG 2212
P 8	-		1 kΩ	PG 2114
P 9	-		500 Ω	PG 1507
P 10	-		20 kΩ	PG 3209
P 11			2 kΩ	PG 2212
P 12	-		1 kΩ	PG 2114
P 13	-		500 Ω	PG 1507
P 14	-		20 kΩ	PG 3209
P 15	-		2 kΩ	PG 2212
P 16			1 kΩ	PG 2114
P 17	-		500 Ω	PG 1507
P 18			20 kΩ	PG 3209
P 19	-		2 kΩ	PG 2212
P 20	-		1 kΩ	PG 2114
P 21 22	-		20 kΩ	PG 3209
P 23	-		2 kΩ	PG 2212
Q 1-6	Si.	1N4148	75 V/75 mA	QV 0216
Q 8	Ze.	BZX70B6V8	6,7-7,0 V/0,4 W	QV 1374
Q 9-16	Si.	1N4148	75 V/75 mA	QV 0216
Q 17	Ge.	OA47	25 V/110 mA	QV 0094
Q 18	Si.	BY184	1500 V/400 mA	QV 0246
Q 19	Si.	BA158	600 V/400 mA	QV 0245
Q 20,21	Si.	MR911	100 V/100 mA	QV 0253
Q 22	Ze.	AD580JH	2,42-2,57/0,4 W	QV 0046
Q 23	Si.	1N4148	75 V/75 mA	QV 0216
R 1	Carbon	1/4 W 5%	6,8 kΩ	RB 3680
R 2 3	Metal	1%	121 kΩ	RF 5121
R 4	-	-	47,5 kΩ	RF 4475
R 5	-	-	182 Ω	RF 2182
R 6	-	-	47,5 kΩ	RF 4475
R 7	-	-	182 Ω	RF 2182
R 8	-	-	3,16 kΩ	RF 3316
R 9			150 Ω	RF 2150
R 10	-		5,62 kΩ	RF 3562
R 11			150 Ω	RF 2150
R 12			3,16 kΩ	RF 3316
R 13			5,62 kΩ	RF 3562
R 14 15			3,32 kΩ	RF 3332
R 16 17			402 Ω	RF 2402
R 18	-		121 kΩ	RF 5121
R 19	-		12,1 kΩ	RF 4121
R 20 21	-		60,4kΩ	RF 4604
R 22	-		19,6 kΩ	RF 4196
R 23	-		121 kΩ	RF 5121
R 24			12,1 kΩ	RF 4121
R 25			19,6 kΩ	RF 4196
R 26			3,48 kΩ	RF 3348
R 27			33,2 kΩ	RF 4332
R 28			232 kΩ	RF 5232
R 29			619 kΩ	RF 5619
R 30			3,48 kΩ	RF 3348
R 31			33,2 kΩ	RF 4332
R 32			232 kΩ	RF 5232
R 33			619 kΩ	RF 5619
R 34	Carbon	5%	100 kΩ	RB 5100
R 35			6,8 kΩ	RB 3680
R 36	Meta	1%	121 kΩ	RF 5121
R 38			47,5 kΩ	RF 4475
R 39	-	-	182 Ω	RF 2182

PARTS LIST

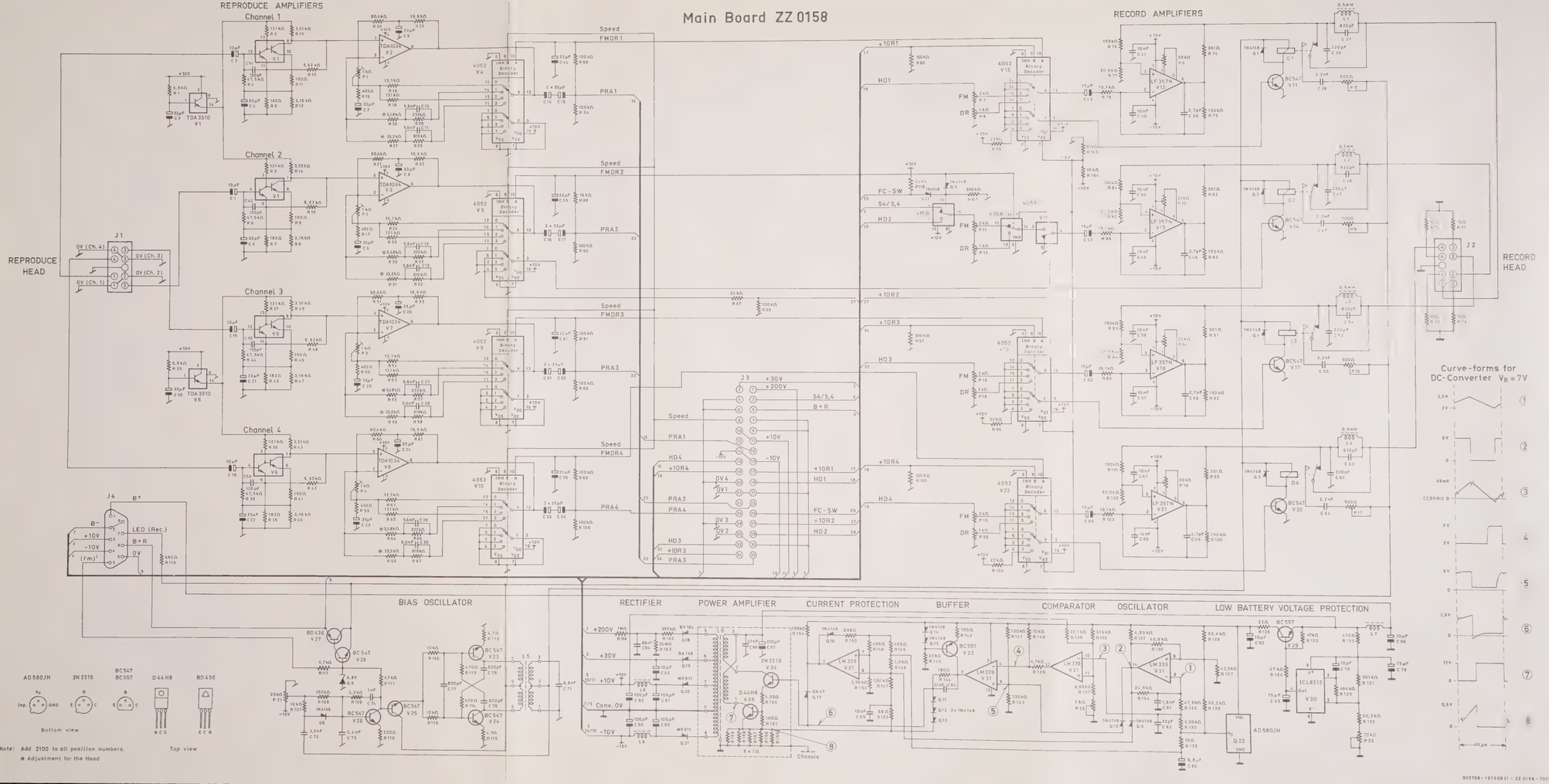
R 40	Metal	1/4 W	1%	3,16 kΩ	RF 3316
R 41	-		-	150 Ω	RF 2150
R 42		-	-	5,62 kΩ	RF 3562
R 43	-	-	-	3,32 kΩ	RF 3332
R 44	-		-	47,5 kΩ	RF 4475
R 45	-	-	-	182 Ω	RF 2182
R 46	-	-	-	150 Ω	RF 2150
R 47	-	-	-	3,16 kΩ	RF 3316
R 48	-			5,62 kΩ	RF 3562
R 49	-	-	-	3,32 kΩ	RF 3332
R 50	-	-		402 Ω	RF 2402
R 51	-	-	-	60,4 kΩ	RF 4604
R 52	-	-	-	19,6 kΩ	RF 4196
R 53	-	-		187 kΩ	RF 5187
R 54	-		-	121 kΩ	RF 5121
R 55	-	-	-	12,1 kΩ	RF 4121
R 56	-	-	-	3,48 kΩ	RF 3348
R 57	-	-	-	33,2 kΩ	RF 4332
R 58	-	-	-	232 kΩ	RF 5232
R 59	-	-	-	619 kΩ	RF 5619
R 60	-		-	402 kΩ	RF 5402
R 61	-	-	-	60,4 kΩ	RF 4604
R 62	-		-	121 kΩ	RF 5121
R 63	-	-	-	12,1 kΩ	RF 4121
R 64	-	-	-	3,48 kΩ	RF 3348
R 65	-	-	-	33,2 kΩ	RF 4332
R 66				232 kΩ	RF 5232
R 67	-	-	-	619 kΩ	RF 5619
R 68,69	Carbon	-	5%	100 kΩ	RB 5100
R 70-73	Metal	-	1%	10,0 Ω	RF 1100
R 74	-	-	-	301 Ω	RF 2301
R 75,76	-	-	-	150 kΩ	RF 5150
R 77	-	-	-	20,0 kΩ	RF 4200
R 78	-	-	-	19,1 kΩ	RF 4191
R 79	Carbon	-	5%	22 kΩ	RB 4220
R 80,81	-	-	-	100 kΩ	RB 5100
R 82	Metal	-	1%	301 Ω	RF 2301
R 83,84	-		-	150 kΩ	RF 5150
R 85	-	-	-	20,0 kΩ	RF 4200
R 86	-	-		19,1 kΩ	RF 4191
R 87	Carbon	-	5%	22 kΩ	RB 4220
R 88	-		-	18 kΩ	RB 4180
R 89,90	-		-	100 kΩ	RB 5100
R 91	Metal		1%	301 Ω	RF 2301
R 92,93	-	-	-	150 kΩ	RF 5150
R 94		-		20,0 kΩ	RF 4200
R 95	-	-	-	19,1 kΩ	RF 4191
R 96	Carbon	-	5%	22 kΩ	RB 4220
R 97,98	-	-	-	100 kΩ	RB 5100
R 99	Metal	-	1%	301 Ω	RF 2301
R 100,101	-	-	-	150 kΩ	RF 5150
R 102	-		-	20,0 kΩ	RF 4200
R 103		-	-	19,1 kΩ	RF 4191
R 104	Carbon		5%	22 kΩ	RB 4220
R 105,106				100 kΩ	RB 5100
R 107				10 kΩ	RB 4100
R 108	-	-		150 kΩ	RB 5150
R 109		-		3,3 kΩ	RB 3330
R 110				220 Ω	RB 2220
R 111				47 kΩ	RB 4470
R 112			-	4,7 Ω	RB 0470
R 113,114		-		470 Ω	RB 2470
R 115				4,7 Ω	RB 0470
R 116		-		10 kΩ	RB 4100
R 117	-		-	4,7 kΩ	RB 3470
R 118				22 kΩ	RB 4220
R 119				680 Ω	RB 2680
R 120				470 Ω	RB 2470
R 121	Metal		1%	301 kΩ	RF 5301
R 122	-			40,2 kΩ	RF 4402
R 123,124	Carbon		5%	47 kΩ	RB 4470
R 125	Metal	1/4 W	1%	464 kΩ	RF 5464
R 126	Carbon		5%	22 Ω	RB 1220
R 127	Metal	-	1%	42,2 kΩ	RF 4422
R 128		-	-	60,4 kΩ	RF 4604
R 129		-	-	33,2 kΩ	RF 4332
R 130		-	-	49,9 kΩ	RF 4499
R 131		-	-	4,99 kΩ	RF 3499
R 132	-	-	-	47,5 kΩ	RF 4475
R 133		-	-	2,00 kΩ	RF 3200
R 134	-	-	-	24,9 kΩ	RF 4249
R 135	Carbon	-	5%	10 Ω	RB 1100
R 136	Metal	-	1%	316 kΩ	RF 5316
R 137	-	-	-	6,65 kΩ	RF 3665
R 138	-		-	22,1 kΩ	RF 4221
R 139	Carbon	-	5%	4,7 kΩ	RB 3470
R 140	-		-	10 kΩ	RB 4100
R 141	-		-	100 kΩ	RB 5100
R 142	-	-	-	220 kΩ	RB 5220
R 143			-	100 Ω	RB 2100
R 144	-			180 Ω	RB 2180
R 145	-	-		22 kΩ	RB 4220
R 146	Metal	-	1%	1,00 kΩ	RF 3100
R 147	-		-	1,62 kΩ	RF 3162
R 148,149				499 Ω	RF 2499
R 150			-	698 Ω	RF 2698
R 152			-	2,55 kΩ	RF 3255
R 153	Carbon		5%	68 Ω	RB 1680
R 154	-	-		100 kΩ	RB 5100
R 155-159	Metal		2%	1,00 Ω	RF 9210
R 160	-	-	1%	4,99 Ω	RF 0499
R 161	Carbon	-	5%	100 Ω	RB 2100
R 162	-	-		330 kΩ	RB 5330
R 163	-	-		20 MΩ	RH 0903
R 164-166	-			10 kΩ	RB 4100
R 167	-	-	-	330 kΩ	RB 5330
R 168	Metal	-	1%	1,00 MΩ	RF 6100

V 1	Trans. Array	TDA3310	VE 0168
V 2,3	Op Amp	TDA1034	VE 0127
V 4,5	Dif 4 Ch. Mult./Demult.	4052B	VD 2086
V 6	Trans. Array	TDA3310	VE 0168
V 7,8	Op. Amp	TDA1034	VE 0127
V 9,10	Dif 4 Ch. Mult./Demult.	4052B	VD 2086
V 11	Silicon NPN	BC547b	VB 0603
V 12	Op. Amp	LF357N	VE 0167
V 13	Dif. 4 Ch Mult./Demult.	4052B	VD 2086
V 14	Silicon NPN	BC547b	VB 0603
V 15	Op. Amp	LF357N	VE 0167
V 16	3 × 2 Ch Mult./Demult	4053B	VD 2087
V 17	Silicon NPN	BC547b	VB 0603
V 18	Op. Amp.	LF357N	VE 0167
V 19	Dif. 4 Ch Mult./Demult	4052B	VB 2086
V 20	Silicon NPN	BC547b	VB 0603
V 21	Op. Amp	LF357N	VE 0167
V 22	Dif 4 Ch. Mult./Demult	4052B	VD 2086
V 23 26	Silicon NPN	BC547b	VB 0603
V 27	- PNP	BD436	VB 0120
V 28	- NPN	BC547b	VB 0603
V 29	- PNP	BC557b	VB 0135
V 30	Voltage Detector/Indicator	ICL8212	VE 0166
V 31	Comparator	LM339N	VE 0110
V 32	Silicon PNP	BC557b	VB 0135
V 34	- NPN	2N2219	VB 0588
V 35	-	D44H8	VB 0585

14-pin Socket	JJ 1416
Printed Circuit Board	XC 1588

Main Board ZZ 0158

CIRCUIT DIAGRAM

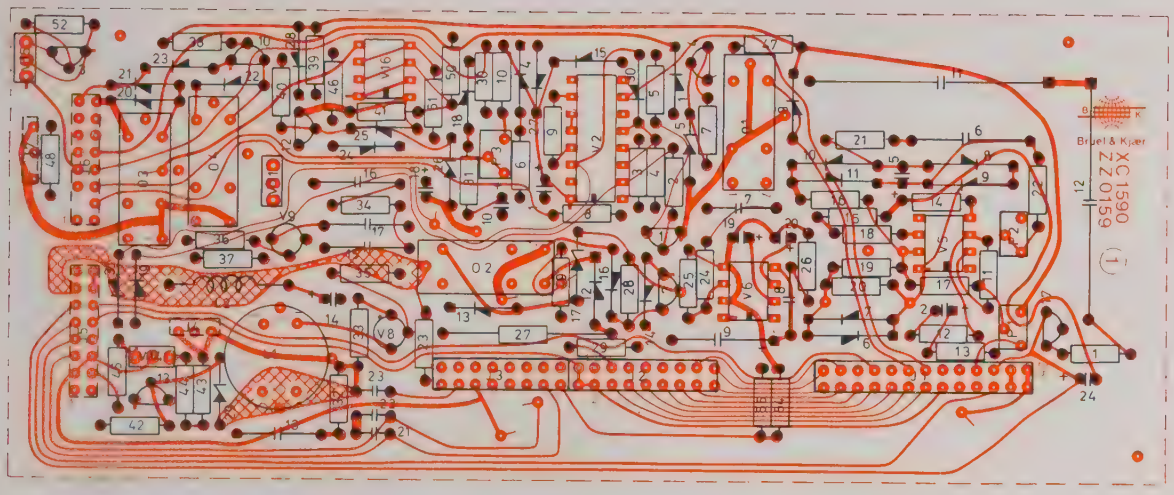


Note: Add 2100 to all position numbers.

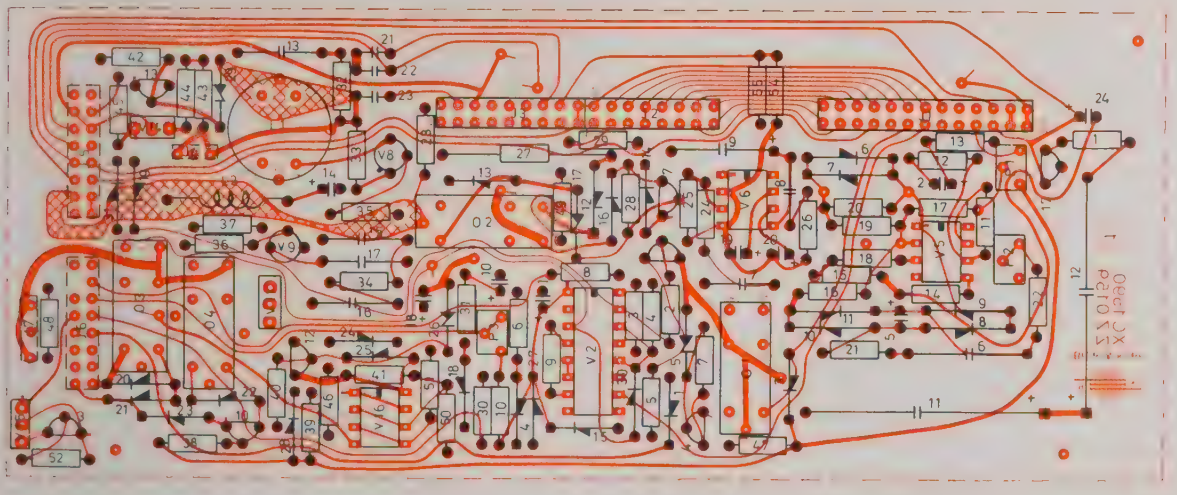
* Adjustment for the Head

903768-19730821 - ZZ 0158 - 7005

LAYOUT DIAGRAM



Viewed from the printed circuit side



Viewed from the component side

PARTS LIST

Note. Add 2300 to all position numbers

C 1	Electrolytic		1 µF/ 63 V	CE 0540
C 2			4,7 µF/ 40 V	CE 0475
C 5	-		15 µF/ 25 V	CE 0474
C 6	Tantalum		22 µF/ 15 V	CF 0042
C 7,8	Ceramic		47 nF 30 V	CK 4470
C 9	Electrolytic		22 µF/ 10 V	CE 0203
C 10	-		1 µF/ 63 V	CE 0540
C 11,12	-		3300 µF/ 16 V	CE 0360
C 13	Polystyrene	1%	940 pF/500 V	CT 1300
C 14	Electrolytic		22 µF/ 10 V	CE 0352
C 15	Polystyrene	1%	3,3 nF/ 30 V	CT 1544
C 16	-	1%	200 pF/125 V	CT 1118
C 17	-	1%	3,3 nF/ 30 V	CT 1544
C 18	Electrolytic		33 µF/ 16 V	CE 0346
C 19	-		10 µF/ 40 V	CE 0473
C 20	-		1 µF/ 63 V	CE 0540
C 21-23	Ceramic		4,7 nF/400 V	CK 3470
C 24	Electrolytic		10 µF/ 40 V	CE 0473
J 1	26-pin Plug			JP 2605
J 2,3	34-pin Plug			JP 3404
L 1	Transformer			LB 0824
L 2	Coil		14 µH	LJ 0009
O 1	Relay			OC 0059
O 2-4				OC 0058
P 1	Cermet		500 kΩ	PG 4511
P 2	-		5 kΩ	PG 2524
P 3	-		20 kΩ	PG 3209

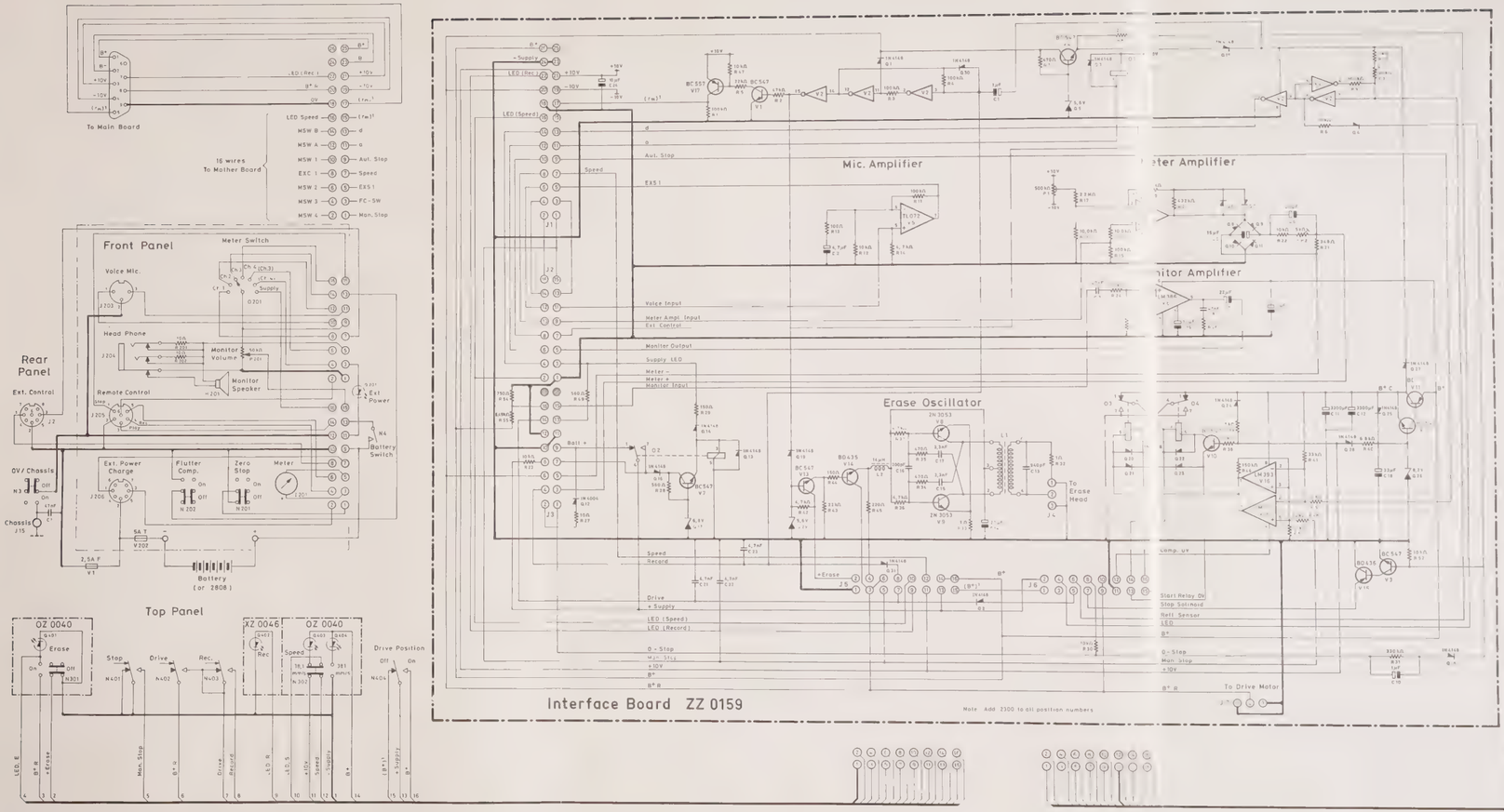
Q 1-4	Si	1N4148	75 V/75 mA	QV 0216
Q 5	Ze	BZX79C5V6	5,3-5,9 V/0,25 W	QV 1105
Q 6,7	Si	ZS150/151	50 V/250 mA	QV 0226
Q 8-11	Ge	OA47	25 V/110 mA	QV 0094
Q 12	Si	4004	400 V/1 A	QV 0237
Q 13 16	Si	1N4148	75 V/75 mA	QV 0216
Q 17	Ze	BZX79C6V8	6,0-7,5 V/0,25 W	QV 1106
Q 18 25	Si	1N4148	75 V/75 mA	QV 0216
Q 26	Ze	BZX79C8V2	7,8-8,6 V/0,25 W	QV 1344
Q 27,28	Si	1N4148	75 V/75 mA	QV 0216
Q 29	Ze	BZX79C5V6	5,6-6 V/0,25 W	QV 1107
Q 30, 31	Si	IN4148	75 V/75 mA	QV 0216

R 1	Carbon	1/4 W	5%	100 kΩ RB 5100
R 2				47 kΩ RB 4470
R 3 4				100 kΩ RB 5100
R 5	-	-	-	22 kΩ RB 4220
R 6		-		10 kΩ RB 4100
R 7		-		470 Ω RB 2470
R 8		-		120 Ω RB 2120
R 9		-		100 kΩ RB 5100
R 10				1 kΩ RB 3100
R 11				100 kΩ RB 5100
R 12		-		10 kΩ RB 4100
R 13				100 Ω RB 2100
R 14	-	-	-	4,7 kΩ RB 3470
R 15		-	-	100 kΩ RB 5100

R 16	Metal	1/4 W	1%	10,0 kΩ RF 4100
R 17	Carbon	-	10%	2,2 MΩ RB 6220
R 18	Metal	-	1%	10,0 kΩ RF 4100
R 19	-	-	-	20,5 kΩ RF 4205
R 20	-	-		432 kΩ RF 5432
R 21	-	-	-	348 Ω RF 2348
R 22, 23	Carbon	-	5%	10 kΩ RB 4100
R 24				33 kΩ RB 4330
R 25				4,7 kΩ RB 3470
R 26	-		-	10 Ω RB 1100
R 27	Wire	4 W	10%	10 Ω RX 0324
R 28	Carbon	1/4 W	5%	560 Ω RB 2560
R 29				150 Ω RB 2150
R 30	-	-		10 kΩ RB 4100
R 31	-	-	-	330 kΩ RB 5330
R 32,33	Metal	-	1%	1,00 Ω RF 9210
R 34,35	Carbon	-	5%	470 Ω RB 2470
R 36,37	-	-		4,7 kΩ RB 3470
R 38		-	-	10 kΩ RB 4100
R 39	-	-		1,0 kΩ RB 3100
R 40	-	-	-	6,8 kΩ RB 3680
R 41	-	-	-	33 kΩ RB 4330
R 42		-	-	4,7 kΩ RB 3470
R 43		-	-	22 kΩ RB 4220
R 44		-		150 Ω RB 2150
R 45	-	-	-	220 Ω RB 2220
R 46	-	-		150 kΩ RB 5150
R 47	-	-	-	10 kΩ RB 4100
R 48				22 kΩ RB 4220
R 49		-		560 Ω RB 2560
R 50-52	-	-		10 kΩ RB 4100
R 54	Metal	-	1%	750 Ω RF 2750
R 55	-	-		6,49 kΩ RF 3649

V 1	Silicon	NPN	BC547b	VB 0603
V 2	6 × Buffer/Conv.	(invert)	4049BE	VD 2024
V 3,4	Silicon	NPN	BC547b	VB 0603
V 5	Op. Amp		TL072	VE 0146
V 6			LM386	VE 0162
V 7	Silicon	NPN	BC547b	VB 0603
V 8,9			2N3053	VB 0251
V 10			BC547b	VB 0603
V 11	-	PNP	BD436	VB 0120
V 12 13	-	NPN	BC547b	VB 0603
V 14	-		BD435	VB 0557
V 15		PNP	BD436	VB 0120
V 16	2 × Comparator		LM393	VE 0163
V 17	Silicon	PNP	BC557	VB 0135

8-pin Socket	JJ 0817
16-pin Socket	JJ 1631
Printed Circuit Board	XC 1590


To Main Board
16 wires
To Mother Board
LED Speed
MSW B
MSW A
MSW 1
EXC 1
MSW 2
MSW 3
MSW 4
Front Panel
Rear Panel
Top Panel
Meter Switch
Voice Mic.
Head Phone
Monitor Volume
Monitor Speaker
Remote Control
Ext. Control
Ext. Power
Battery Switch
Ext. Power Charge
Flutter Comp.
Zero Stop
Meter
0V / Chassis
Chassis
2,5A F
5A T
Battery
(or 2808)
OZ 0040
Erase
Stop
Drive
Rec.
OZ 0046
Speed
Drive Position
Mic. Amplifier
Erase Oscillator
To Erase Head
To Drive Motor
Interface Board ZZ 0159
Note Add 2300 to all position numbers

Circuit Diagram **See ZZ 0159**

Front Panel UA 0621

Note: Add 200 to all position numbers

H 1	"Monitor Speaker"			HP 0024
I 1	"Meter"		100µA	IM 0078
J 2	Socket for Fuse			JS 0007
J 3	"Voice Mic."			JJ 0313
J 4	"Head Phone"			JJ 0323
J 5	"Remote Control"			JJ 0605
J 6	"Ext. Power Charge"			JJ 0719
N 1	ZERO STOP			NN 0031
N 2	FLUTTER COMP.			NN 0031
O 1	METER SWITCH			OI 0036
P 1	"Monitor Volume" log		50 kΩ	PD 3511
Q 1	LED			QV 4002
R 1,2	Carbon	1/4 W 5%	10 Ω	RB 1100
V 2	Fuse, slow		5 A	VF 0015
	P.C. Board for LED			XZ 0046

Mother Board ZH 0187

Note: Add 1300 to all position numbers.

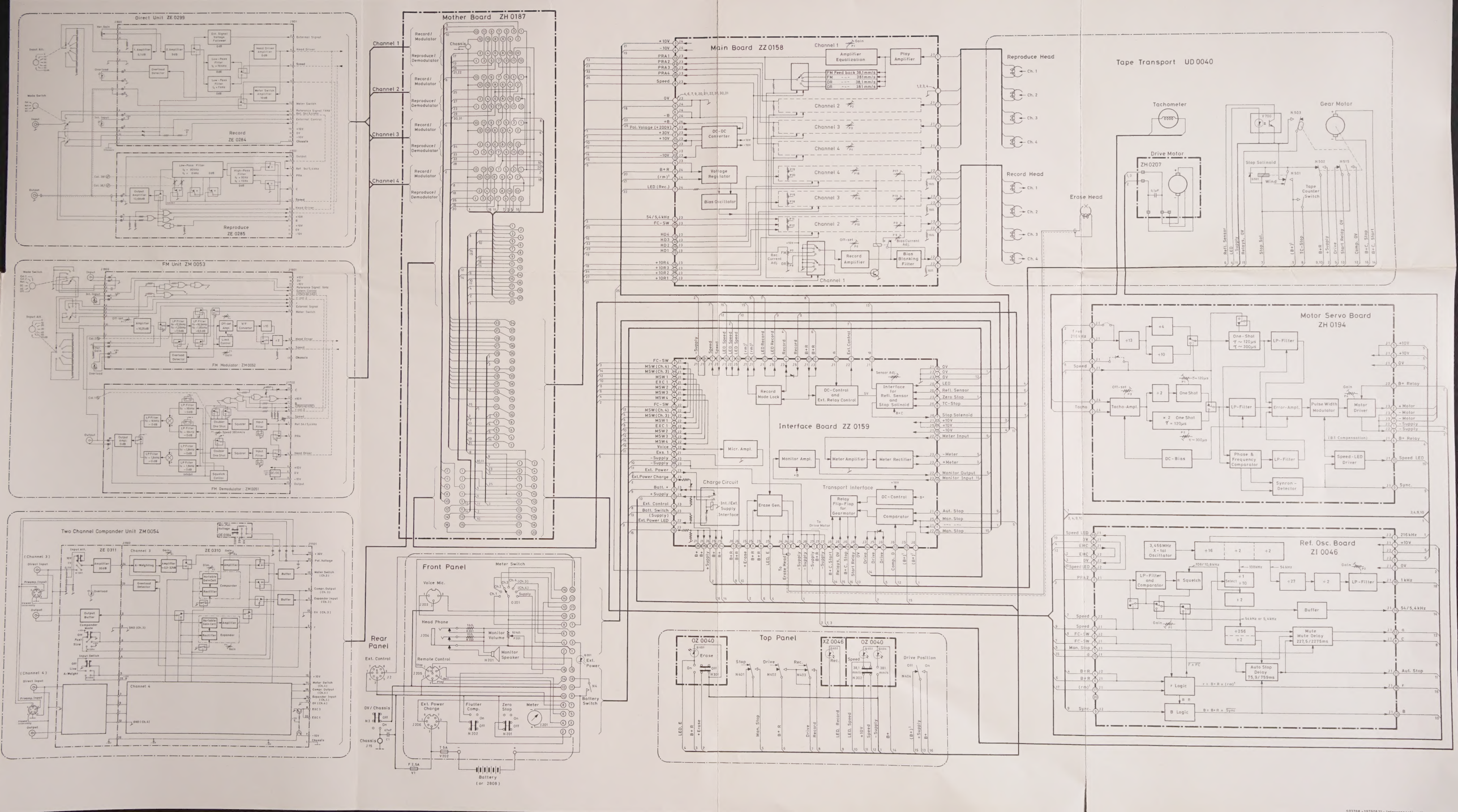
J 1-8	13-pin Socket	JJ 1301
J 9	21-pin Socket	JJ 2102
J 10	16-pin Plug	JP 1603
J 11	20-pin Plug	JP 2011
J 12	34-pin Plug	JP 3402
	Printed Circuit Board	XC 1580

Miscellaneous

C 1	Polyester	47 nF/250 V	CS 0109
C 1501	-	0,1 µF/100ÅV	CS 0436
J 1	Socket for Fuse		JS 0038
J 2	"Ext. Control"		JJ 0802
J 15	"Chassis"		JT 6204
N 3	0 V/CHASSIS		NN 0082
N 4	SWITCH		NT 0032
N 301	ERASE		NN 0110
N 302	SPEED		NN 0110
N 401	STOP		NT 0201
N 402	DRIVE		NT 0201
N 403	REC.		NT 0201
N 404	DRIVE POSITION		NT 0011
N 501	"Stop Solenoid"		NT 0204
N 502	Microswitch		NT 0204
N 503	-		NT 0202
N 515	-		NT 0119
Q 401-404	LED		QV 4002
Q 501	Si. 1N4148	75 V/75 mA	QV 0216
V 1	Fuse, fast	2,5 A	VF 0029
V 701	Infared Sensor GaAs: Si	OB 710	VD 0094

Furthermore 7005/6 includes the following Subassemblies the details of which will be found under the respective numbers.

Direct Unit	ZE 0299
Servo Board	ZH 0194
Reference Oscillator Board	ZI 0046
FM Unit	ZM 0053
Two Channel Compander Unit	ZM 0054
Main Board	ZZ 0158
Interface Board	ZZ 0159


Direct Unit ZE 0299
Record ZE 0284
Reproduce ZE 0285
FM Unit ZM 0053
FM Modulator ZM 0052
FM Demodulator ZM 0051
Two Channel Compander Unit ZM 0054
Mother Board ZH 0187
Channel 1
Channel 2
Channel 3
Channel 4
Main Board ZZ 0158
Interface Board ZZ 0159
Front Panel
Rear Panel
Top Panel
Tape Transport UD 0040
Reproduce Head
Record Head
Erase Head
Tachometer
Drive Motor ZH 0207
Gear Motor
Motor Servo Board ZH 0194
Ref. Osc. Board ZI 0046
Battery (or 2808)